AN INVESTIGATION OF TECHNICAL SUPPORT ISSUES INFLUENCING USER SATISFACTION

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Dissertation Prepared for the Degree of

DOCTOR OF PHILOSOPHY

UNIVERSITY OF NORTH TEXAS

May 2000

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Gutierrez, Charletta Frances, An investigation of technical support issues influencing user satisfaction. Doctor of Philosophy (Business Computer Information Systems), May 2000, 146 pp., 42 tables, 3 illustrations, references, 145 titles.

The widespread distribution of personal computers (PCs) throughout organizations has made a substantial impact on information systems. Additionally, the tremendous growth of the Internet has changed the way business is carried out. As the user population evolves into a much more technical and demanding group, their needs are also changing. With this change, Management Information Systems (MIS) departments must develop new ways of providing service and support to the user community.

This study investigates the relationship between information systems support structures, support services, service quality and the characteristics of a diverse user population. This includes investigating technical support issues influencing user satisfaction. This study attempts to improve the understanding of the support function within MIS. The results of this study clarify the support needs of the users and identify user satisfaction factors, as well as factors relative to the quality of the support received.

Six streams of prior research were reviewed when developing the research framework. These include: user support, end users and end-user computing,

identifying and classifying user types, information centers, user satisfaction, service quality and other sources of computer support.

A survey instrument was designed using the (UIS) user satisfaction instrument developed by Doll and Torkzadeh (1988) and the SERVQUAL instrument as modified by Kettinger and Lee (1994). The survey was distributed to 720 individuals. A total of 155 usable responses were analyzed providing mixed results. Of the ten hypotheses, only four were rejected. The finding of this study differ from those in earlier studies. The variables that were found to be significant to the users for service quality are the method of support that is provided to the user, i.e., help desk or local MIS support and the support technician's experience level.

For user satisfaction the location of the service personnel made a difference to the end user. As with service quality, the support technician's experience level added to the users' satisfaction with MIS support. The results of this study are pertinent to managers of MIS departments as it clarifies the support needs of the users and identifies issues of user satisfaction and service quality.

ACKNOWLEDGMENTS

The author wishes to thank the members of her dissertation committee (John Windsor, Robert Pavur, Richard Vedder and Randall Schumacker) for all their guidance. Special thanks go to Oduro Asante and Gary Jones of Sabre Incorporated. Addition thanks go to the members of the expert panel for their insights. Finally, the author wishes to thank her family for all their support and patience during this long process.

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CHAPTER I

INTRODUCTION

Overview of the Computer Support Issue

The widespread distribution of personal computers (PCs) throughout organizations has made a substantial impact on information systems (Boivie, 1994). Additionally, the expansion of end-user computing (EUC) has greatly affected information systems, especially the support function. Furthermore, the tremendous growth of the Internet has changed the way business is carried out (El Sawy and Bowles, 1997; Guimaraes, Gupta and Rainer, 1999). As more users come on-line, they become more technically aware. The computer support needed from Management Information Systems (MIS) departments for these users has been evolving as more and more users become acquainted with a wide variety of hardware and software (Cohen and Ledford, 1994; Anastasi, 1996; Lazar, 1999). That is, as the user population evolves into a much more technical and demanding group, their needs are also changing. With this change, MIS must develop new ways of providing service and support to the user community (Lowry, 1996; Khandpur and Laub, 1997; Guimaraes, Gupta and Rainer, 1999).

MIS departments offer a variety of services to users. However, user support is not the main focus for the department. MIS departments historically place development projects at a much higher priority than user support (Grupe, 1993; Gallagher, 1995; Govindarajulu, 1996). The assignment of lesser skilled employees to the user support

function is typical (Waltner, 1998). Such assignments can be either in the form of help desk personnel or hands-on technicians (Anastasi, 1996; Breshears, 1996, Foster, 1996a; Metcalfe, 1998; Lazar, 1999). Currently the support function is just as important as any development project because of its visibility and impact on the user (Fitzgerald, 1992; Grupe, 1993; Green, 1996; Khandpur and Laub, 1997). According to Byrne and Castellano (1998), technical support specialists are, at times, the only direct line to customers, and future success hinges on the job they perform.

MIS support organizations at one time only providing the service of acquisition and deployment of PC hardware and software (Anastasi, 1996; Byrne and Castellano, 1998). Users' perception of the technical support persons was that they were there to unpack the boxes, test the equipment, install the software and then everything would work correctly (Byrne and Castellano, 1998). Support includes much more than just setting a workstation on a user's desk, i.e., acquisition, and loading software, i.e., deployment (Anastasi, 1996). Expanding the support function to include such services as hardware and software support, training, general consulting, product support, help desk, advanced technical support, quality assurance, troubleshooting, network connectivity, security access and virus protection is necessary (Leitheiser and Wetherbe, 1986; Harris, 1995; El Sawy and Bowles, 1997, Metcalfe, 1998). With all the above functions and services, it is important for a support organization to understand the issues and identify the critical factors for success (Rockart, 1979; Hammond, 1982; Leitheiser and Wetherbe, 1986; Yoon, 1992; Hoopes, 1993; Ku, 1994).

The Changing Face of Computer Support

Previous research has focused on Information Centers (ICs) as the primary support organization within the MIS department (Hammond, 1982; Hoopes, 1993; Harris, 1995). In their original form, Information Centers were a way for MIS to train, support and manage EUC (Hammond, 1982). Bringing more and more computer power to the desktop has resulted in the MIS support organization growing beyond that of an Information Center. While ICs support EUC, MIS support organizations must now service a much more diverse user population. Some users are experts in technology, while others lack training and/or experience with the computer technology required to perform their job functions (Lazar, 1999).

Several studies have demonstrated user Some users are experts in technology, while others lack training and/or experience with the computer technology required to perform their job functions (Lazar, 1999). dissatisfaction with support from ICs (Bergeron, Rivard and De Serre, 1990; Rainer and Carr, 1992; Nord and Nord, 1994; Ku, 1994; Govindarajulu, 1996; Govindarajulu and Reithel, 1998; Guimaraes, Gupta and Rainer, 1999). As users become more dissatisfied with IC support, they are seeking help from other support sources, in and out of the MIS department (George, Kling, and Iacono, 1990; Bowman, et al., 1993; Ku, 1994, Govindarajulu, 1996; Govindarajulu and Reithel, 1998; Lazar, 1999). Because of this trend to seek support elsewhere, MIS departments are being forced to adjust the way they provide support services in order to meet the changing needs of users (Stockford, 1998; Guimaraes, Gupta and Rainer, 1999; Lazar, 1999). Therefore, MIS must view users as customers; who are able to purchase services

elsewhere (Baer, 1995; Lewis, 1996a, 1996b; Lazar, 1999). Additionally, they must treat the delivery of information services as a business transaction between an Information System (IS) service provider and the customers/users (Ferguson and Zawacki 1993; Kettinger and Lee, 1994). According to Essex, Magal and Masteller, (1998), effective customer support and service has become a strategic imperative and we should, therefore, treat internal users and external customers with the same level of service.

More recently, with the advancement of the Internet, the MIS department has additional tools for providing user support (Orzech, 1998; Stockford, 1998; Waltner, 1998). Web pages designed to provide remote access for recurrent support questions are freeing up the support technicians for more critical support issues (El Sawy and Bowles, 1997; Foster, 1998a, 1998b; Waltner, 1998; Palvia & Palvia, 1999). In addition, the Internet has provided another source of computer support entirely (El Sawy, and Bowles, 1997; Foster, 1998a, Jastrow, 1998; Palvia and Palvia, 1999).

Purpose, Problem and Significance

This study investigates the relationship between information systems support structures, support services, service quality and the characteristics of a diverse user population. This includes investigating technical support issues influencing user satisfaction in the areas of software, hardware and infrastructure support, providing a foundation on how to provide support services based on the type of user supported.

Many organizations have one or more help desks for users to call for support of technology (Ripple, 1992; Rome, 1995, Anthes, 1998). Users call the help desk for any and all problems they have with their computers, whether for hardware, software, "how to"

questions, or network problems. However, help desk personnel have become complacent and somewhat unresponsive to some users (Foster, 1996c, 1998b). They assume that the users do not understand or know what is causing their problem (Hammond, 1982; Baer, 1995; Foster, 1996c, Bussert, 1998). This attitude does not work with the more sophisticated users (McLean, 1979; Diamond, 1995). Users do not have time to stay on the phone for hours to try to solve problems (Breshears, 1996; Anthes, 1998). The MIS departments must make an effort to improve help desk response time, improve personnel attitudes toward users, and also provide viable solutions to the user population (Hoffman, 1994; Breshears, 1996; El Sawy and Bowles, 1997; Bussert, 1998; Waltner, 1999). This generates the need for a new support model (Ripple, 1992; Hilton, 1996; Hoffman, 1996; Cross, Earl and Sampler, 1997; Govindarajulu and Reithel, 1998). This research makes an attempt to define this new support model.

Information system success has received much attention in MIS research, with the main focus being on development and implementation of systems and the subsequent usage of the system (Hunton and Beeler, 1997; Govindarajulu and Reithel, 1998; Downing, 1999; Hwang and Thorn, 1999; Karahanna and Straub, 1999, Khalil and Elkordy, 1999). The success of the support function and/or support organization has claimed a small portion of this research. As noted previously, a majority of the research on support organizations has focused on ICs (Govindarajulu and Reithel, 1998). As documented in the literature, the most popular measure of success is user satisfaction (Rockart and Flannery, 1983; Kelleher, 1993; Winter, Gutek and Chidoba, 1993; Herald, 1996; Hilton, 1996; Holsapple and Luo, 1996; Khandpur and Laub, 1997; McHaney and

Cronan, 1998; Woodroof and Kasper, 1998; Hwang and Thorn, 1999). While user satisfaction is important for the success of a support organization, it is only one factor to be considered. Galletta and Lederer (1989) and Watson, Pitt, and Kavan (1998) stress the importance of looking at other measures of success, i.e., quality factors. This research probes into the factors that keep users satisfied with the technology on their desk, specifically the information support function (Barnett, 1985; Leitheiser and Wetherbe, 1986; Alavi, Nelson and Weiss, 1987; Davis, 1988; Collins, 1995; McKeown, 1994; Lucas, 1995; Kim, 1996; Hoffman, 1998). It also looks at other factors that could influence the success of a support organization.

Another function that falls under the control of the MIS department, that has changed significantly since the advent of local area networks (LANs), is the organization's backbone and infrastructure (Holsapple and Luo, 1996; Musthaler, 1996; Raha, 1996; De Michelis, et al., 1998; Ferris, 1998; Gloede, 1998, Lazar, 1999). This is one area of importance that has been consistently overlooked as a support function. LANs, e-mail, client/server computing, and the widespread use of the Internet have highlighted this component of support (Ferris, 1998, Gloede, 1998). While infrastructure support is not usually a function of an IC, it is an important component of MIS, and a highly visible component for the end user (Musthaler, 1996; Raha, 1996; De Michelis, et al., 1998).

Khandpur and Laub (1997) define *technical support* as "software support and remote service functions of hardware support." This includes "all product support that can be provided to a customer from a remote location, *support by wire*." The definition

of technical support used in this study is much broader, and includes all customer support, hardware, software and infrastructure; remote and on-site. Additionally, this study includes a focus on advanced technical support issues. That is, this research makes a distinction between help desk services and advanced technical support services.

While help desks and other support organizations both serve some of the same customers, a help desk has a different focus than an advanced technical support organization. For example, typically one would rate a help desk by call volume. That is, the number of minutes it takes to answer a question or pass it on to the next level (Breshears, 1996). Help desks service repetitive questions; that is, many users call in for the same problem or a similar problem that can be answered quickly (Breshears, 1996). On the other hand, advanced technical support organizations deal with more time-consuming and/or critical problems. They can help users on the "one-of-a-kind" problems, some of which may take days to research, while others require immediate solutions.

As previously identified, many problems exist in the support function of MIS departments. Although researchers have previously studied the support function, they have overlooked the specific issues relating to user type. This research addresses the above problems by first identifying the current support issues, secondly addressing support beyond the help desk, and thirdly, looking at advanced support issues and infrastructure issues.

This research takes a look at support from both the technician and the user's point of view in several organizations. With the exception of the web responses, all of the

companies surveyed either have internal computer support organizations, or have contracted computer support. The pilot study was conducted concurrently at two divisions of the AMR Corporation, American Airlines and The Sabre Group. These two companies fit the profile because The Sabre Group has an extensive internal computer support organization and American Airlines uses The Sabre Group for their contracted phone and on-site computer support.

The aim of this research is to improve the understanding of the support function within MIS. The results of this study clarify the support needs of the users and identify user satisfaction factors, as well as factors relative to the quality of the support received. This information is valuable for managers who wish to create a support organization within MIS or would like to redesign the present support function. Further, it attempts to expand the foundation of the current research in this area, while providing an avenue for continued research.

CHAPTER II

PRIOR RESEARCH

Overview

This study draws upon several streams of research, in and out of MIS, that feed the investigation of user support. These research streams are computer user type, information center research, end-user computing, user satisfaction, service quality and other sources of computer support. Because the support function is touched upon by much research, this discussion will be limited to the major works in each stream. Some of the measures reported in prior research, that may attribute to the success of a support organization, are listed below:

1. type of system
   - client/server
   - LAN based apps
   - desktop applications
   - mainframe based apps
   - purchased software (shrink wrap)
   - in-house developed apps
   - distributed systems

2. type of user
   - McLean's (1979) classification into DPP and DPU(DPA,NTU)
   - Rockart and Flannery's (1983)classification of end users
   - Cotterman and Kumar (1989) a three-dimensional cube

3. user expectations and attitudes
   - includes satisfaction with support (Doll and Torkzadeh (1988))
   - user perceptions
4. quality of support

- SERVQUAL measures
- other quality measures

5. alternative sources of support
   - local experts
   - local MIS staff
   - help desk (internal and external)
   - Internet sources

6. Level of support
   - help desk
   - 1st level
   - 2nd level
   - advanced technical support

7. method of support
   - help desk
   - local MIS support
   - centralized MIS support
   - on-line help
   - by application type
   - by support required
   - tier support levels
   - IC

8. location of support personnel
   - help desk
   - local proximity

User Support

According to Bill Rose (1995), founder of the Software Support Professionals Association (SSPA), the support organization exists for one purpose, "helping customers use the computer systems in front of them." According to El Sawy and Bowles (1997), effective customer support and service is a strategic necessity for successful

organizations. Tourniaire and Farrell (1997, p.4) sum up the importance of the MIS support function in their statement,

> Just as good service is a differentiator in the customer's buying decision in many businesses, more and more we see support becoming one in regard to software purchases. Good support--or, better, excellent support--is not a nice extra we provide customers but an essential part of what is required to have satisfied, loyal customers, which in turn helps to increase revenues and maximize profits.

This statement can be applied to all phases of MIS. The differentiator between user support and customer service is the process of solving a technical problem (Gallagher, 1995). User support has become the competitive differentiator between the use of the MIS department and users seeking services and/or products elsewhere (Khandpur and Laub, 1997; Tourniaire and Farrell 1997). User support consists of support of hardware, support of software and infrastructure support. Additionally, each of these support areas includes several other functions. For example, software support may include functionality of the program, failure of the software, training, or simple "how to" questions. Hardware support may include acquisition of new equipment, installing memory chips, or fixing and replacing bad components. Infrastructure support may include connectivity to the LAN, to the Internet, e-mail or message flow, or reducing traffic on the backbone to increase the speed of data flow. The above suggestions are just a few of the subtasks that are included in each of the support components.

According to Khandpur and Laub (1997), industry changes are forcing changes in the structure and services offered by a technical support organization. Table 1, adapted

from Khandpur and Laub (1997), shows some of the contributing factors affecting the support organization and attributing to the change.

Table 1: Factors affecting the support industry

Factor	Past Environment	Current Environment
Number of computer systems	Few	Many
Cost of systems	High	Low
Number of Users	Few	Many
Technical expertise of users	High	Mixed
Layers of software	Few	Many
Sources of software	Few	Many
Per-unit cost of software	High	Medium/low
Product margins	High	Low
Degree of networking	Low	High

Adapted from: Khandpur and Laub (1997, p. 3)

Much of the previous research into computer support has been specifically on the help desk as the sole provider of technical support. While the help desk is usually the first place users go for support it is not the only option available. According to Gallagher (1995), there are five types of major support inquiries, 1) educational questions, 2) installation support, 3) user errors, 4) software errors, and 5) interfacing with third-party vendors for solutions. Each of these questions may be answered by a different support group within the support organization. For example, there may be a special account or support specialist that may call a certain vendor for support. The support specialist acts as the interface between the vendor and the user.

User support is a service organization; as technology changes, and as the products supported become more complex, the job of user support becomes more difficult. According to Bussert (1998), "we can put too much technology in place." Technicians require more training to become knowledgeable in the diverse products and technology that they must support (Byrne and Castellano, 1998). Additionally, the technician's social and communication skills are contributing factors to the success of a support organization (Breshears, 1996; Hoffman, 1998, Foster, 1998a, 1998b).

End-User Computing (EUC)

End-user computing has greatly affected MIS. EUC is an alternative approach to the traditional information systems development strategy (Carr, 1987; Rivard and Huff, 1988; Hoopes, 1993). End-users are taking control and responsibility for their own systems, one of the reasons is because of the backlog and perceived unresponsiveness of the IS organization (McLean and Kappelman, 1992; 1993, Essex, Magal and Masteller, 1998; Guimaraes, Gupta and Rainer, 1999). According to McLean and Kappelman (1992; 1993) users desire control of their own information resources. With the reduction in the cost of hardware, along with the availability of easy to use development software, users can take control by developing their own applications (McLean and Kappelman, 1992; 1993). In addition, Essex, Magal and Masteller (1998), state that advances in technology and increased user literacy also have impacted the growth of end-user computing.

End-user computing, as defined by Alavi (1985), is a phenomenon where the user of the results of the computing also acts as the creator of the software specifications necessary to generate the computing system. This means that the user writes the design specification for the application, creates the code and then uses the end product. Another definition of EUC is given by Doll and Torkzadeh (1988), end-user computing refers to direct interaction with application software by managerial, professional and operating level personnel in user departments that are separate for IS.

EUC has greatly affected the support function of the IS organization. When end-users try to take the programming function into their own departments unique technical support issues arise (Govindarajulu and Reithel, 1998).

The many advantages and/or benefits of EUC identified in previous literature are presented in Table 2, while Table 3 provides a summary of the disadvantages and/or problems identified. In addition to those listed in Table 2 and Table 3, some of the less documented issues include ownership of data, ownership of the programs and copywrite issues. Many times programs developed by end users are hardware and/or platform specific (Gloede, 1998). If a specific end-user program has an impact on the organization and management sees the advantage of distributing the program to other departments, they have to call in the IS support organization to perform the implementation. In many cases, the implementation could take as long as the development of the original EUC system.

Table 2: EUC advantages and benefits

Advantages/Benefits of EUC		
	Item	Source(s)
1	Users know what they want	Alavi (1985) Essex, Magal and Masteller (1998)
2	Users can obtain needed information quickly	Alavi (1985) Essex, Magal and Masteller (1998)
3	More successful system implementations	Alavi (1985) Sipior and Sanders (1989) Davis and Bostrom (1993)
4	Improvements in user work methods; productivity	Alavi (1985) Sipior and Sanders (1989) Davis and Bostrom (1993) Govindarajulu (1996)
5	Improved user satisfaction	Rivard and Huff (1984) Igbaria and Nachman (1990) Davis and Bostrom (1993) McHaney and Cronan (1998)
6	Users maintain direct control	Igbaria and Nachman (1990) McLean and Kappelman(1992;1993) Davis and Bostrom (1993) Govindarajulu (1996) Essex, Magal and Massteller (1998)
7	Enhanced decision making effectiveness	Sipior and Sanders (1989) Govindarajulu (1996) McHaney and Cronan (1998)
8	Reduction of MIS department application backlog	McLean (1979) Cheney, Mann and Amoroso (1986) Sipior and Sanders (1989) McLean and Kappelman(1992;1993) Davis and Bostrom (1993) Hoopes (1993) Ku (1994)

Table 3: EUC disadvantages and problems (risks)

Disadvantages/Problems with EUC		
	Item	Source(s)
1	User inexperience with development	Alavi (1985)
2	Inefficient applications created by end-users	Alavi (1985) Alavi, Nelson and Weiss (1987)
3	Not sufficient testing or validation done by end-users	Sipior and Sanders (1989) Essex, Magal and Masteller (1998)
4	Computer hardware/software incompatibilities	Hoopes (1993) McLean and Kappelman (1992) Gloede (1998)
5	No explicit definition of EUC exists	Munro, Huff and Moore (1987) Rivard and Huff (1988) Grupe (1993) Govindarajulu (1996) Govindarajulu and Reithel (1998)
6	Not sufficient management of EUC	Alavi and Weiss (1985) Munro, Huff and Moore (1987) Grupe (1993) Hoopes (1993)
7	Cannot justify the increased costs of EUC	Davis (1988) Hoopes (1993)
8	High growth rate	Rivard and Huff (1988) Sipior and Sanders (1989)
9	Insufficient end-user training and support	Sipior and Sanders (1989) Guimaraes and Ramanujam (1986) Govindarajulu (1996)
10	Poor maintainability of user developed systems	Guimaraes and Ramanujam (1986) Govindarajulu (1996)
11	Lack of data integrity and backups	Guimaraes and Ramanujam (1986) Govindarajulu (1996)
12	Insufficient purchasing, development and support policies	Bergeron and Berube (1990) Guimaraes, Gupta and Rainer (1999)

The benefits and problems of end-user computing have been repeated in much of the published EUC literature. Additionally, some benefits may also become disadvantages in terms of user effectiveness and productivity. When users develop their own applications they are taking time away from their primary job function, and as such, become less effective and productive in their work (Magal, Carr and Watson, 1988; Hoopes, 1993). In order to decrease the risks associated with EUC, and for EUC to be effective, organizations must develop strategies for quality assurance, management, and control (Rockart and Flannery, 1983).

Identifying and Classifying User Types

Harrison and Rainer (1992) make the distinction between end-users and end-user computing. End-users are those individuals who use the output from the computer application but do not participate in the production of that application. In contrast, end-user computing is the hands-on practice of defining and retrieving the needed information. Bergeron and Berube (1990) state that end-users are management employees, using such products as spreadsheets, databases and word processing.

McLean (1979) provides the first classification scheme of end-users. He divides user into data processing professionals (DPP), employed by the MIS department, who write code for the use of others, and data processing users (DPU). Data Processing users are further divided into Data Processing amateurs (DPA), who write code for their own use, in other words, EUC, and non-data processing trained users (NTU), those who use the output from others' efforts.

Rockart and Flannery (1983) provide the most cited classification of end-users. Rockart and Flannery (1983) classify end-users into six distinct user types. Each of these user types requires different handling of education, support and control (Rockart and Flannery, 1983).

1. Nonprogramming end-users - access to computerized data is limited to a set of followed procedures

2. Command level users - access data on their own terms, they understand the data and are able to specify, access and manipulate information using report generators of 4GL languages

3. End-user programmers - use both command and procedural languages directly for their own personal informational needs, they develop their own applications, for use by themselves or others in their respective departments

4. Functional support personnel - sophisticated programmers supporting other end-users within the functional area, i.e., not employed by the MIS department or trained in Information Systems development

5. End-user computing support personnel - sophisticated programmers support other end-users from a central support organization, usually an Information Center, employed by the MIS department and trained in support of end-user computing tools and software

6. Data Processing programmer - traditional programmers, programming in end-user languages, employed by the MIS department, act as "contract programmers" to functional areas

Cotterman and Kumar (1989) provide an even greater breakdown of user types. They use a three-dimensional cube to classify end-users. The three dimensions used are end-user development, end-user operation, and end-user control. Within each of these dimensions, users are defined as producers/consumers and pure consumers. Cotterman and Kumar (1989) choose to leave out individuals who are traditional programmers and

also EUC analysts. The following are the definitions of end users and end-user computing as given by Cotterman and Kumar (1989).

> "An *end-user* is any organizational unit or person who has an interaction with the computer-based information system as a consumer or producer/consumer of information."
>
> "*End-user computing* is the producer activities of the end users relative to the organization's computer-based information system."

The final classification scheme of Cotterman and Kumar (1989) is provided in Table 4. As is shown in the table, users can be consumers, operators, controllers and developers or a combination of all.

Table 4: Cotterman and Kumar's user classification scheme(1989)

User Classification
User-consumer
User-operator
User-developer
User-controller
User-operator/developer
User-developer/controller
User-operator/controller
User-operator/developer/controller

The present study takes into consideration the classification schemes of McLean's (1979) DPP and DPU(DPA,NTU) and Cotterman and Kumar's (1989) user-consumer classification to expand Rockart and Flannery's (1983) nonprogramming end-user types. This classifies nonprogramming users in terms of their proficiency with the system; computer illiterate and computer literate nonprogramming users. Additionally, this study

includes a user classification between Rockart and Flannery's (1983) end-user computing support personnel and data processing programmer called "professional technical support personnel." This study also recognizes that all users are consumers. Therefore, data processing programmers are also end-users at one time or another and therefore this study uses an expanded version of Rockart and Flannery's (1983) classification scheme taking into account Cotterman and Kumar's (1989) and McLean's (1979) classification schemes.

Information Centers

Head (1985) reports that the information center concept developed during the 1970's by IBM. He states that the focus of an information center was to facilitate end-user access to data bases stored in large mainframes (Head, 1985). According to Head (1985), this focus has changed to include end-user computing, which is not only mainframe oriented but includes midrange and desktop computing as well. Information centers have come along way since the first mainframe center. In his article, Head (1985) penned the name "information resource center" as alias for an information center, which he defines as a "facility dedicated to technology transfer."

Christy and White (1987) investigated six information centers. They define the information center concept as "a centralized group of user-oriented personnel that provides support and training." The factors they found as critical for success were:

1. Establishing hardware and software guidelines to insure compatibility
2. Characteristics of the Information Center staff
3. Quick response time to the user requests
4. Finding "champions" in the user population
5. Establishing clear lines of responsibility
6. Eliminating the control philosophy of the MIS department

7. Insuring cost-effectiveness by a formal justification process

Bergeron, Rivard and De Serre (1990), in an article that reports on the role of information centers, found one factor that was of critical importance. These authors found that "user support" provided by the information center is that critical factor. This is of prime importance to the current study, as support issues are the basis for this study.

A study by Magel and Carr (1988) examined the effects of age, size, and hardware options on the success of information centers. The three most important variables that came out of this study were competent staff, communication with the users, and top management support. The authors identified five critical success factors associated with these three variables. The five critical success factors found were:

1. Commitment to the information center concept
2. Quality of the information center support services
3. Facilitation of end-user computing
4. Role clarity between user and information center staff
5. Coordination of end-user computing.

Another study by Magal, Carr and Watson (1988) focused on the information centers management rather than its' users. The results of that study determined five components for quality of support services of the information center. These are:

1. A competent information center staff
2. Support of software packages available to the users
3. Training for the end-users
4. Reliability of the applications developed
5. Training for information center staff.

This study is mentioned because it focuses on the quality aspect of the support services, which is incorporated into the present study.

Smith (1992) identified services provided by the user assistance center at Ameritas Life Insurance. User assistance center in this case is another alias for an information center. This study is mentioned because it focuses on a specific case and the change that the company went through to improve the center. The services that were most important at Ameritas were identified as:

1. Support of hardware and vendor-supplied software
2. Support of custom application software
3. Workshops and individual user training
4. Software distribution responsibilities
5. Inventory and problem report data management

The changes, once implemented, resulted in quicker user response and freeing up IS staff for project development. Additionally, consistency in support was obtained across all departments. Productivity increased and field personnel questions were answered in a well-defined manner by properly trained staff (Smith, 1992).

Essex, Magal and Masteller (1998) and Guimaraes, Gupta and Rainer (1999) state that advances in technology and the inability of traditional centralized methods to deliver information quickly and adequately have resulted in the quick expansion of EUC, which in turn, has made the IC of critical importance to the organization. According to the above authors, as users become more technical and as technology advances, users become more demanding and therefore, use of the IC increases. Guimaraes, Gupta and Rainer (1999) identify the IC critical success factors as follows:

1. Commitment to the IC concept
2. Quality of IC support services
3. Facilitation of end-user computing
4. Role clarity

5. Coordination of end-user computing

Carr (1987), Christy and White (1987) and Anastasi (1996) point out that the focus of information centers should change. Kaull (1991) and Hoopes (1993) suggest that ICs should move away from support and/or training and start assisting only those users who can make a "significant contribution" to the corporate bottom line. All these authors agree that a change must occur in the way information centers support users, they just don't agree on the focus of that change.

User Satisfaction

The measurement of user satisfaction has been used in traditional data processing environments as a surrogate measure of information system (IS) success. DeLone and McLean (1992) identify six dimensions of information success. These are: system quality, information quality, use, user satisfaction, individual impact and organizational impact. This study addresses support function issues within an information system department. Therefore, of the six dimensions identified by DeLone and McLean (1992), user satisfaction (UIS) is the most appropriate dimension to measure the success of the support organization.

Bailey and Pearson (1988) define satisfaction in any given situation as: the "sum of one's feelings or attitudes toward a variety of factors affecting that situation." The literature contains many instances where researchers attempt to measure user satisfaction (Bailey and Pearson, 1983). Bailey and Pearson (1983) take the results of 22 previous studies to come up with a comprehensive list of factors that affect user satisfaction. An

instrument to measure user satisfaction (UIS) was the result of this effort. Although this was not the first attempt to create a tool to measure user satisfaction, this was the first attempt to validate and check for reliability of an instrument.

Ives, Olson and Baroudi (1983) took the Bailey and Pearson UIS instrument and attempted to improve the quality of the instrument. Ives and Olson (1984) produced a shorter instrument by reducing the number of items per scale. Ives and Olson (1984) studied user involvement as a necessary condition of user satisfaction. According to Ives and Olson (1984) user involvement is active participation in the system development process. Ives and Olson (1984) added the construct of user involvement to the UIS instrument.

Raymond (1987), in a further attempt to extend the Bailey and Pearson instrument as modified by Ives, Olson and Baroudi (1983), eliminated scales less relevant to small organizations, thus reducing the instrument down to 20 items. This instrument became a tool for evaluating the success of information systems in small organizations. His research further refined and validated the Bailey and Pearson (1983) UIS instrument.

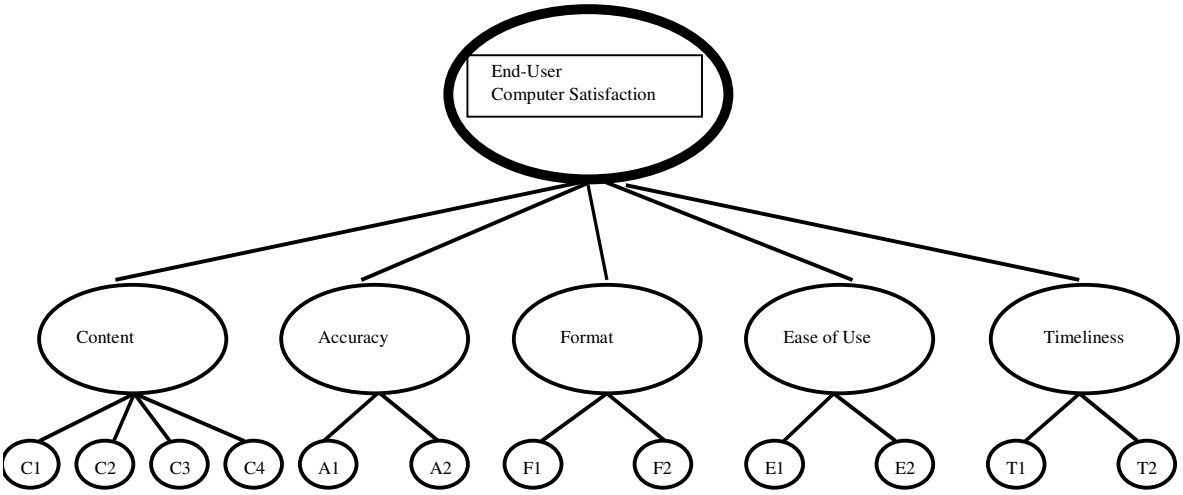
Baroudi and Orlikowski (1988) also took the Bailey and Pearson (1983) UIS instrument as modified by Ives, Olson and Baroudi (1983) to create the short form, and extended the research on the UIS instrument. In their study, Baroudi and Orlikowski (1988) conducted a psychometric evaluation of the instrument and again tested its validity and reliability. They observed that the UIS was only tested on large-scale transaction processing information systems. It has not been tested on the satisfaction of users of any

other types of systems or environments. Therefore, UIS is only appropriate in some situations (Baroudi and Orlikowski, 1988). The authors suggest modifying the instrument for each application and/or environment.

Doll and Torkzadeh (1988) created an instrument of user satisfaction and applied it to end-user computing. In particular they created it for use on one specific application at a time, not a variety of applications concurrently. They used the work of Bailey and Pearson (1983) and Ives, Olson and Baroudi (1983) as background for their instrument development. Doll and Torkzadeh (1988) modified the UIS by removing items specific to the traditional development environment and adding items specific to the end-user computing environment. Specifically, they added some items to measure ease of use. Watson, Pitt and Kavan (1998) were one group of researcher among many to validate the Doll and Torkzadeh instrument. In addition the authors created a structured interview questionnaire where users responded to open-ended questions about satisfaction with the application. The final model from Doll and Torkzadeh (1988) is presented in Figure 1.

Figure 1: Model for measuring end-user computer satisfaction

(Doll and Torkzadeh, 1988)



Example questions for each of the factors are listed below:

CONTENT

C1: Does the system provide the precise information you need?
C2: Does the information content meet your needs?
C3: Does the system provide reports that seem to be just about exactly what you need?
C4: Does the system provide sufficient information?

ACCURACY

A1: Is the system accurate?
A2: Are you satisfied with the accuracy of the system?

FORMAT

F1: Do you think the output is presented in a useful format?
F2: Is the information clear?

EASE OF USE

E1: Is the system user friendly?
E2: Is the system easy to use?

TIMELINESS

T1: Do you get the information you need in time?
T2: Does the system provide up-to-date information?

Igbaria and Nachman (1990) also take the Bailey and Pearson (1983) instrument as modified by Ives, Olson and Baroudi (1983) and apply it to end-user computing, taking into account the suggestions by Baroudi and Orlikowski (1988). This research revealed three areas underlying end user satisfaction, 1) information product, 2) EDP staff and services and 3) knowledge and involvement (Igbaria and Nachman, 1990). Users are more satisfied with unrestricted access to the hardware and software tools needed to perform their jobs according to this study. The study also found that computer anxiety had a negative effect on user satisfaction (Igbaria and Nachman, 1990).

Galletta and Lederer (1989) explain the importance of selecting user satisfaction as the independent variable for system success. However, they point out that user satisfaction is hard to measure accurately. They suggest that attitudes and perceptions are different measures than satisfaction, and as such, should not be ignored in research. Galletta and Lederer (1989) contend in their attempt to shorten the Bailey and Pearson (1983) instrument, Ives, Olson and Baroudi (1983) eliminated some of the most important items. They also propose that the Likert-type scales are problematic across individuals, as each individual may interpret the adjective pairs differently. Other problems identified by

Galletta and Lederer (1989) are item heterogeneity and the use of parametric statistics when the data being gathered is ordinal. The final outcome of the research by Galletta and Lederer (1989) was the suggestion that the UIS instrument still needs additional refining to become a more reliable measure of user satisfaction.

Other factors affecting user satisfaction are found throughout the literature. According to Saunders and Jones (1992), the performance of information systems has greatly impacted user satisfaction. In addition they found that the quality of information outputs, IS function operational efficiency, IS staff competence and integration of technologies are additional factors affecting user satisfaction (Saunders and Jones, 1992). Robey, Smith and Vijayasarathy (1993) suggest that user participation and constructive conflict resolution affects project success, which in turn affects user satisfaction with the system. While Hunton and Beeler (1997) suggest that user participation in systems development affects the users' satisfaction with the system. Downing (1999) states that system usage behavior can be used as a measure for determining user satisfaction.

User satisfaction is by far the most popular independent variable for measuring information systems success. As shown by this literature review, user satisfaction can be measured by several replacement variables. As the present study is only interested in the support function within MIS, it incorporates some specific support items of user satisfaction from the Doll and Torkzadeh (1988) UIS and modified them to fit the current study as suggested by Baroudi and Orlikowski (1988).

Service Quality

Much recent research attention has focused on measuring the service quality of Information Systems (Ferguson and Zawacki, 1993; Kettinger and Lee, 1994, 1997; Kettinger, Lee and Lee, 1995; Filipczak, 1995; Pitt, Watson and Kavan, 1995, 1997; Van Dyke, Prybutok and Kappelman, 1995; Kappelman, Van Dyke and Prybutok, 1995; Foster, 1996a, 1996b, 1996c; Maples, 1997; Van Dyke, Kappelman and Prybutok, 1997). In many cases, the marketing instrument used to measure service quality (SERVQUAL), has been adapted to measure IS system quality (Kettinger and Lee, 1994; Kettinger, Lee and Lee, 1995; Pitt, Watson and Kavan, 1995; Maples, 1997; Van Dyke, Kappelman and Prybutok, 1997). However, some researchers suggest that problems may arise when adapting the SERVQUAL instrument to IS (Van Dyke, Prybutok and Kappelman, 1995; Kappelman, Van Dyke and Prybutok, 1995; Maples, 1997).

Parasuraman, Zeithaml and Berry (1988) developed the SERVQUAL scale because of the inadequacy of measurement procedures that existed for the marketing discipline. The constraint measured is perceived service quality. They explain that service quality is a function of the consumers' comparison of the expectations of what service firms should offer, and the perceptions of the performance of the organization. Therefore, service quality is the difference between consumers' perceptions and expectations (Parasuraman, Zeithaml and Berry, 1988). That is, service quality is the calculated gap value between the two measures: perception and expectation.

The ten dimensions that served as the basis for the structure of the original SERVQUAL instrument are:

1. tangibles
2. responsiveness
3. credibility
4. competence
5. access
6. understanding/knowing the customer
7. reliability
8. communication
9. security
10. courtesy

After refinement and testing of the instrument, the 97 item scale was reduced to 22 items, in each of two sections (expectations and perceptions), 44 items in total. The original ten dimensions were reduced to five, as shown in Table 5. The last two dimensions, assurance and empathy, contain items representing the remaining seven of the original dimensions identified by Parasuraman, Zeithaml and Berry (1988).

Carman (1990) states that he was using the SERVQUAL instrument in a replication study to test the reliability and validity of the instrument. Carman (1990) concludes that after "considerable customization" of the instrument, there is only mild support for the reliability and validity of the dimensions. He also suggests that the dimensions are not generic over all service functions or organizations, and users must adapt the SERVQUAL instrument to fit the specific service situation or application. Additionally, Carman (1990) concludes that there are "serious" problems with the treatment of consumers' expectations. He suggests that the importance of these expectations also be measured.

Table 5: Definition of SERVQUAL dimensions

Dimension	Definitions
Tangibles	1. physical facilities 2. equipment 3. appearance of personnel
Reliability	1. Ability to perform the promised service 2. Dependably 3. Accurately
Responsiveness	1. willingness to help customers 2. provide prompt service
Assurance	1. knowledge and courtesy of employees 2. ability to inspire trust and confidence
Empathy	1. caring 2. individualized attention

Adapted from: Parasuraman, Zeithaml and Berry (1988)

Babakus and Boller (1992) examine a number of conceptual and methodological issues uncovered in previous research. They attempt to address these issues as well as those questions raised by Carman (1990).

The questions/issues addressed are:

1. The dimensionality of service quality
2. The appropriateness of operationalizing service quality as a difference or gap score
3. The specific measurement properties associated with SERVQUAL
4. The measurement of service quality across multiple service functions
5. Problems with the measurement of consumer expectations
6. Dimensionality as a function of the type of service industry

The results of the Babakus and Boller (1992) research indicate that the dimensionality of SERVQUAL is not satisfactory. They state that the model provided poor overall fit statistics (Babakus and Boller, 1992). They propose that the wording of the questions may be clouding the issue. "The results suggest that the direction of

wording has created data quality problems." Additionally, they propose that the measure has validity problems and concur with Carman's (1990) observations on the difficulties associated with the measurement of expectations. Babakus and Boller's (1992) final conclusion is that SERVQUAL in its original state is not a valid and reliable instrument, requiring additional refinement.

In an attempt to reply to Carman (1990) and Babakus and Boller (1992), Parasuraman, Berry and Zeithaml (1991) reassessed the SERVQUAL instrument, replicating the previous study five times. It should be noted that the Babakus and Boller (1992) article is referenced by Parasuraman, Berry and Zeithaml (1991), because they carried out their research concurrently. Parasuraman, Berry and Zeithaml (1991) found that the means in the expectation section of the instrument, consistently measured too high as the instrument was set to measure customers' normative expectations (Parasuraman, Berry and Zeithaml, 1991). Because of these high means, the authors made adjustments in the wordings of the questions so as not to lead the respondents. Additionally, they replaced one item in the tangible dimension and one item in the assurance dimension.

Parasuraman, Berry and Zeithaml (1991) state that these changes improve the scores of the reliability coefficients for the perception-minus-expectations gap. These same authors claim that the alpha values for all dimensions are higher, due to the refinements made to SERVQUAL. When assessing the validity of the measurement instrument, Parasuraman, Berry and Zeithaml (1991) claim that SERVQUAL has face

validity, convergent and predictive/concurrent validity on all of the dimensions. However, no case could be made for discriminant validity of the instrument.

Brown, Churchill and Peter (1993) make a comparison of the SERVQUAL instrument and an alternative measure of service quality without the difference scores. They found that SERVQUAL was a reliable measuring instrument. However, they state that the instrument is not valid because it measures the differences between expectations and perceptions, which result in variance restriction effects. Additionally, the SERVQUAL scores were not normally distributed. Brown, Churchill and Peter (1993) conclude that it is better to use a non-difference score version of the SERVQUAL scale. They also note that the items must be adapted to each service industry.

In a second note on improving the SERVQUAL instrument, Parasuraman, Berry and Zeithaml (1993) address each of the issues raised by Brown, Churchill and Peter (1993). Again Parasuraman, Berry and Zeithaml (1993) stress that "the SERVQUAL items are the basic 'skeleton' underlying service quality that can be supplemented with context-specific items," as originally pointed out in Parasuraman, Berry and Zeithaml (1991).

In this section, a quick review of the instrument as it relates to service quality of the IS function is given. Kettinger and Lee (1994) were the first to apply the SERVQUAL instrument to measure service quality of the IS function. Kettinger and Lee (1994) use two measures to determine user satisfaction of the IS function, the SERVQUAL instrument and the user satisfaction instrument (UIS), originally developed

by Bailey and Pearson (1983), revised by Ives, Olson and Baroudi (1983) and revised again in short form by Baroudi and Orlikowski (1988). These measures were discussed in detail in the previous section. Kettinger and Lee (1994) created a model that retained three dimensions from the UIS instrument (knowledge and involvement, information product, and IS staff and services) and two dimensions from the SERVQUAL instrument (reliability and empathy). These two SERVQUAL dimensions were selected from a modified version of SERVQUAL specifically for this IS application. The same method was applied to the UIS instrument. Kettinger and Lee (1994) reported that the inclusion of the two SERVQUAL dimensions is necessary for a more comprehensive model of IS effectiveness.

Van Dyke, Prybutok and Kappelman (1995) and Van Dyke, Kappelman and Prybutok (1997) caution IS researchers on the use of SERVQUAL to measure the quality of IS services. After an extensive review of the literature identifying the problems as noted above, Van Dyke, Prybutok and Kappelman (1995) conducted their own study. Their study used the Kettinger and Lee (1994) modified version of SERVQUAL. The Van Dyke, Prybutok and Kappelman (1995) study did not use student subjects as had Kettinger and Lee (1994) and the service provider was not an internal IS provider. However, the Van Dyke, Prybutok and Kappelman (1995) study did not include the UIS measures. As in the previous research, Van Dyke, Prybutok and Kappelman (1995) found lower than adequate reliability and validity measures. The authors report that the perception-only scores measure more of the variation in both satisfaction and service

quality. In performing the analysis, using LISREL, the authors could not support the four dimensions identified by Kettinger and Lee (1994). Therefore, they conclude that the modified SERVQUAL instrument should be used with caution, as it appears to be neither a reliable nor a valid measurement of service quality.

Kappelman, Van Dyke and Prybutok (1995) present their concerns with the use of SERVQUAL in IS research. After a complete look at prior research, they present the results of their study, which concur that the IS-SERVQUAL and the SERVQUAL instruments must be used with caution. Kappelman, Van Dyke and Prybutok (1995) suggest two alternative procedures for measuring service quality in IS. First they suggest a perceptions-only method of scoring. The second suggestion is to "revise the wording" or combine the expectations and perceptions into one item.

Kettinger, Lee and Lee (1995) again used the IS-SERVQUAL instrument to measure service quality, only this time in a cross-national study. The authors found that the same dimensions measured in the United States and the Netherlands did not fit when the respondents were from Korea or Hong Kong. This implies that cultural differences must be taken into account when applying the SERVQUAL or any other instrument in a multinational environment.

Maples (1997) examined the IS-SERVQUAL instrument in conjunction with an importance scale. He asked the respondents to rate the importance of each of the SERVQUAL items. He then used these importance ratings to place weights on each of the quality items. Maples (1997) found that performance, and performance weighted by

importance, was a much better measure of overall service quality in most groups than the expectations-minus-perception gap methodology. Maples (1997) also found that the introduction of the SERVQUAL instrument changed the individual ratings of quality, thus creating instrumentation bias. In a final note, Maples (1997) concluded that definitions of quality are different in the IS and marketing disciplines. Therefore, it is necessary to provide the respondents with all relevant definitions before administering any questionnaire or survey.

Even with the problems identified in the research the current study uses some of the items from SERVQUAL to expand the UIS instrument in identifying satisfaction in the IS support function. While each of the previous studies was measuring total IS or total service quality, the current study focuses only on the support function and as such, only uses those items that apply to support. Kettinger and Lee (1994, 1997) suggest the use of the SERVQUAL instrument in conjunction with the UIS instrument to get an expanded view of the measurement of user satisfaction. This study takes into account the suggestions of Kappelman, Van Dyke and Prybutok (1995) and revises the wording or some questions. In addition, following the advise of Brown, Churchill and Peter (1993) the instrument was adapted to the IS support environment.

Other Sources of Computer Support

Formal IS support organizations are not the only places users go for support. Baker (1996) suggests that users sometimes go to outside consultants before they approach their internal support organizations, especially small businesses (DeLone, 1988;

Lai, 1994; Palvia and Palvia, 1999). Dryden (1995) states that more and more companies are outsourcing the IS support function; that is, forcing users to look for other avenues of support while paying a premium price for good support (Fitzgerald, 1992; Green, 1996).

Information Center literature includes research on the help desk function. This is because many times it is not possible to separate the help desk from the IC function. However, the help desk does not necessarily have to be an integral part of an IC. It can exist solely as an individual department within IS.

Many users seek out localized MIS staff when they have a problem. Rockart and Flannery (1983) suggested the need for localized support staff. Rainer and Carr (1992) suggested that there is a need for the distribution of support staff to user departments because of the unresponsiveness of the ICs. However, this would mean that IS would lose control of that user area, opening it up for outside support.

Interactive and/or on-line support is another place users go when they have a problem (Lowry, 1996, El Sawy and Bowles (1997); Foster, 1998a; Metcalfe, 1998). This interactive support, while a viable alternative to traditional support methods, is outside the scope of this research.

Many users do not want to wait for an IS professional to answer their questions or fix their problems. Sometimes these are people determined to make their computers work for them (McKeown, 1994). They will look for answers on their own by reading manuals, calling vendors, asking friends and spending their off-work time trying to find a solution. If others make use of such an employee's expertise, and the employee

encourages their questions, he or she becomes a local expert (Obenshain, 1992; McKeown, 1994). Local experts exist even if a formal support staff exists. They are asked for help because they are readily accessible and willing to help. Bowman, *et al.* (1993) concluded that end-users ranked assistance from another user higher than all other sources of assistance. What therefore, must MIS do to keep users from seeking other sources of support?

Summary

According to Gallagher (1995) the differentiator between user support and customer service is the process of solving a technical problem. User support has become the competitive differentiator between the use of the MIS department and users seeking services and/or products elsewhere (Khandpur and Laub, 1997; Tourniaire and Farrell 1997). The components of user support are hardware, software and infrastructure support. Users can now look for support sources in other areas. To keep users (customers), MIS staff must understand the needs and expectations of the user population. This means providing users with superior support.

Several areas in the literature that highlight the available measures have been presented. The two most popular measures for examining these constructs are the Doll and Torkzadeh (1988) UIS instrument and the Parasuraman, Zeithaml and Berry (1991) SERVQUAL instrument. The SERVQUAL instrument was modified for IS research by Kettinger and Lee (1994). Table 6 presents a summary of the research using these instruments and the sample sizes associated with the research.

Table 6: Prior studies, instrument used and studies sample size

Study	Instrument	sample size
Bailey and Pearson (1983)	UIS	32
Ives, Olson and Baroudi (1983)	UIS	200
Baroudi and Orlikowski (1988)	UIS	358
Doll and Torkzadeh (1988)	UIS	618
Doll and Torkzadeh (1989)	UIS	564
Carman (1990)	SERVQUAL	170
Parasuraman, Zeithaml and Berry (1988-1994)	SERVQUAL	290-487
Babakus and Boller (1992)	SERVQUAL	689
Young (1992)	UIS	128
Kettinger and Lee (1994)	UIS/SERVQUAL	342
Harris (1995)	UIS	106
Pitt, Watson and Kavan (1995)	SERVQUAL	237
Herald (1996)	UIS	99
Maples (1997)	SERVQUAL	301
Essex, Magal and Massteller (1998)	UIS	151
Govindarajulu and Reithel (1998)	UIS	108

One must look at support from all angles. The literature presented in this chapter focuses on user support in general, as well as end-users and end-user computing, identifying and classifying user types, information centers, user satisfaction and service quality. Previous research has revealed that users placed more importance on data and functional support than on other areas of support such as hardware or software support.

The component of network and/or infrastructure support is lacking in much of the literature. This area of support is addressed in this study. Until now, research has not adequately addressed functional levels of support. The present study also includes functional levels of support as a characteristic of user support with particular emphasis on advanced support issues.

CHAPTER III

RESEARCH FRAMEWORK

Overview

This chapter begins with an introduction to the total research framework for IS support developed from prior research. The framework serves two purposes. First, it helps organize the literature reviewed in chapter 2. Second, the framework provides a direction for the present study. Next, a reduced version of the framework is presented. It describes the constructs of interest for the present study. A discussion of the independent variables, dependent variables and a moderating variable follow. The research questions are presented at the end of the discussion.

Framework Development

Figure 2 illustrates the total research framework from which this research came. The framework contains influences of user satisfaction pertains to the support function. User satisfaction has long been the favored measure of overall information system success (Rockart and Flannery, 1983; Kelleher, 1993; Winter, Gutek and Chidoba, 1993; Khandpur and Laub, 1997). Six categories feed the UIS and IS-SERVQUAL combined instrument to measure user satisfaction. These categories are: External (Industry Type), Organization-Specific (Organization Size, Organization Structure), User-Specific (Type of User, Individual Differences, User Expectations, User Perceptions, User Attitudes), System-Specific (Type of System), MIS Support-Specific (Method of Support, Type of

Support, Support Technician's Level, Support Staff Skills, Location of Support Staff, IS Support Structure) and Other Available Support (Local Expert, Vender, Consultants).

The primary focus of this study was to investigate and identify support structures and requirements necessary to meet the needs and expectations of the changing user population. This includes determining the factors influencing user satisfaction and service quality. Therefore, this study looks at some of the more important variables that are expected to influence these two dimensions. Additionally, the study is interested in support beyond the help desk, therefore it is necessary to look at the variables that may influence this issue. The study is also interested in infrastructure and network support.

To meet the above requirements and to narrow down the study to a reasonable undertaking, this study examines 1) method of support, 2) location of support staff, 3) the support technicians' level, 4) type of support, each taken across 5) user type. In addition, system type is included in the evaluation to provide insight into the infrastructure and network support issue. Figure 3 is the reduced model of the research framework. This modified version of the research framework shows the interaction between the independent variables and the dependent variables of interest used in this study.

Figure 2: Total research framework

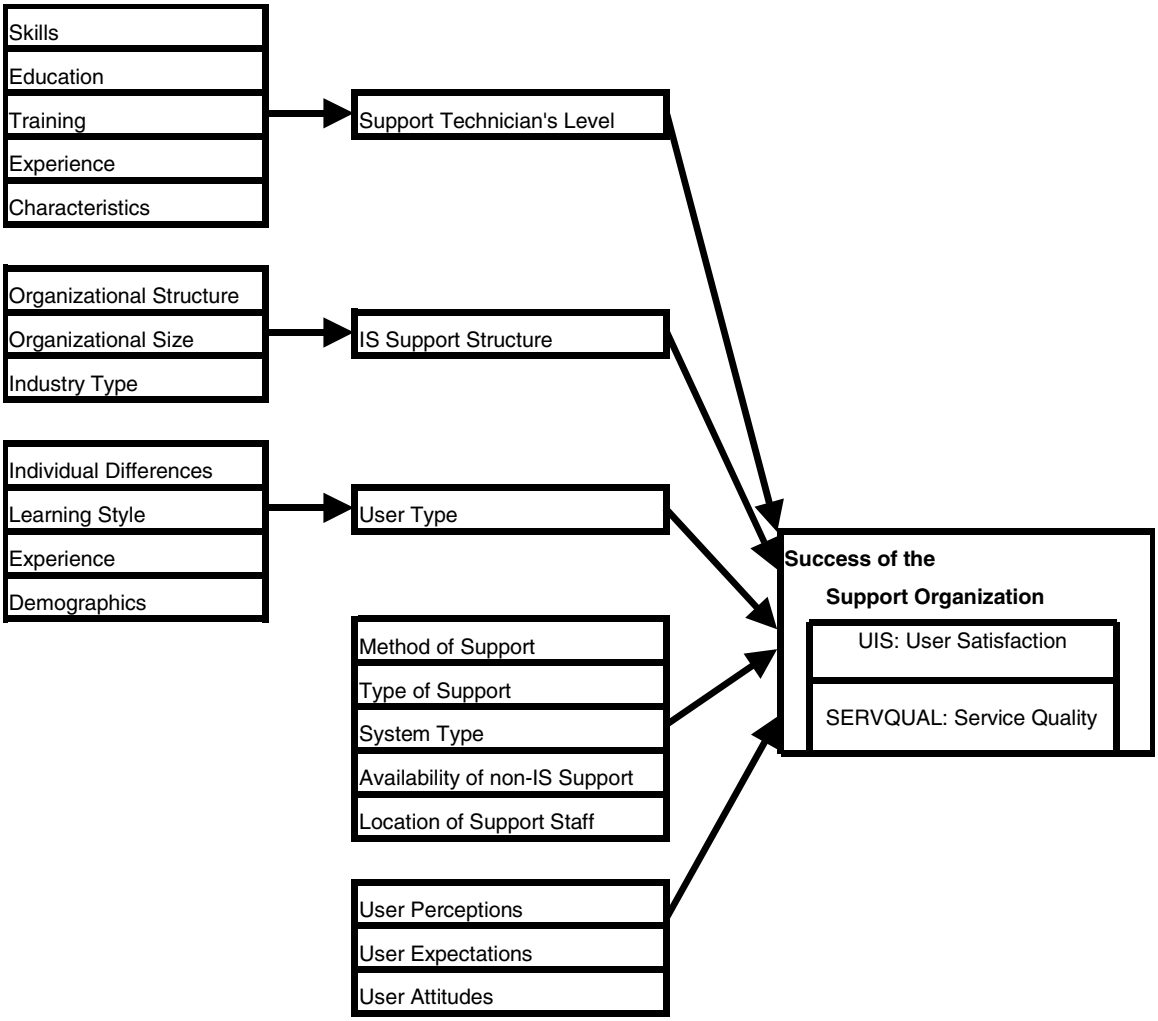


Figure 3: Modified research framework

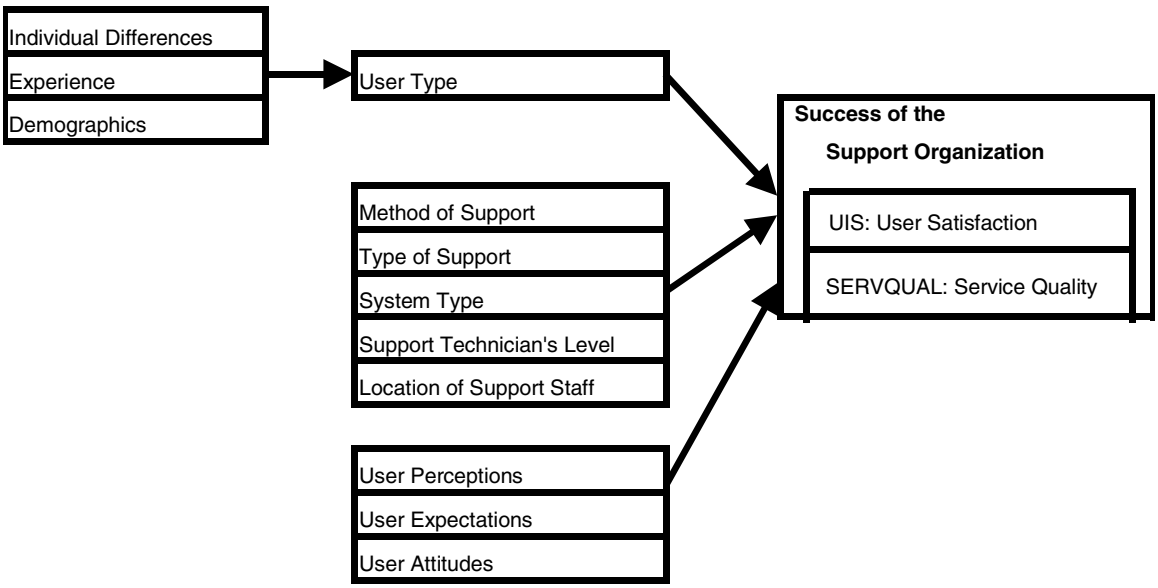


Table 7: Independent variables

Variable	Description
System Type	1. Purchased software (shrink-wrapped) 2. Purchased software (developed) 3. Client/server software 4. LAN based applications 5. In-house developed software 6. Communications Software 7. E-mail 8. Intranet/Internet 9. Mainframe (IMS,TSO,DB2, etc)
Method of Support	1. Helpdesk 2. Local MIS 3. Centralized MIS 4. On-line Help 5. Information Center 6. By application or Function
Support technician's Level	1. Helpdesk 2. Multiple application – some experience 3. Advanced technical support 4. Engineering
Location of support staff	1. Local Support 2. Non-local support
Type of Support	1. Hardware/software 2. Infrastructure/Platform 3. Consulting/Training 4. Acquisition and deployment 5. Advanced technical support 6. Virus protection/backups

Independent Variables

As shown in Figure 2, there are several independent variables for the total research framework. The reduced set of variables specific to this study are shown in Table 7. Variable names and a description of the variables are included in the table.

Dependent Variables

Two surrogates, user satisfaction and service quality, measure the dependent variable (support organization success). The combined UIS/IS-SERVQUAL instrument includes measures of the independent variables. As suggested in the prior research section, the IS-SERVQUAL instrument is used in conjunction with a UIS instrument to get an expanded view of the measurement of user satisfaction (Kettinger and Lee, 1994). Additionally, the final measurement instrument includes only those items that apply to support. That is, the questions from prior research that are not related to user support were eliminated from the instrument.

Moderating Variable

This study uses as a moderating variable, user type. The surrogates measured are user demographics, in addition to a self-measure of user type. Cohen and Cohen (1983) define the term moderator variable as "any variable *v* that interacts with another so as to enhance predictability of a criterion." The moderating variable measures the interaction with, and influence on user satisfaction and service quality with regard to the support function, as influenced by the type of user.

Table 8: Moderating variable

Variable	Description
User Type	1. Computer-illiterate (non-programmer) 2. Computer-literate (non-programmer) 3. Command level user 4. End-user programmer 5. Functional support personnel 6. End-user computer support personnel 7. Technical support personnel 8. Data processing programmer

Research Questions

This study addresses the following questions. When looking at the success of the support function, the constructs of service quality and user satisfaction were examined with respect to their dimensions. Are these the correct measures to determine the success of the support function? To partially answer this question, the following eight primary research questions addressed in this study are:

Q1: Does a relationship exist between service quality and method of support, taking into consideration user type?

Q2: Does a relationship exist between service quality and location of support staff, taking into consideration user type?

Q3: Does a relationship exist between service quality and type of support, taking into consideration user type?

Q4: Does a relationship exist between service quality and the support technician's level, taking into consideration user types?

Q5: Does a relationship exist between user satisfaction and method of support, taking into consideration user type?

Q6: Does a relationship exist between user satisfaction and location of support staff, taking into consideration user type?

Q7: Does a relationship exist between user satisfaction and type of support, taking into consideration user type?

Q8: Does a relationship exist between user satisfaction and the support technician's level, taking into consideration user type?

In addition to the previous questions, two more general questions are asked in reference to system type:

Q9: What is the relationship between system type and service quality?

Q10: What is the relationship between system type and user satisfaction?

Summary

This chapter presented the research framework used to conduct this study. The total research framework was introduced first, followed by the reduced framework used in this study. A presentation of the variables followed and the chapter concluded with the research questions for the study.

CHAPTER IV

RESEARCH METHODOLOGY

Overview

This chapter is devoted to a description of the methodology used to develop this research. It begins with a discussion of the research design methodology and continues with the statistical hypotheses developed from the research questions. A discussion of the instrument design and validation follows. Additionally, the pilot study data collection procedures and results are presented. The chapter ends with a discussion of the data collection process for the main study and a brief discussion of the sample sizes from previous studies.

Research Design

This study involves survey research strategy. This was implemented using mailed and electronic survey forms. Survey research is appropriate for an area such as support where we are interested in evaluating factual information about a particular situation (Harris, 1995). In addition, we are looking for the opinions and expectations of the users of the support function. Many researchers also call the survey format opinion research.

The support organization is critical to the effective functioning of MIS and is the phenomenon of interest for this study. Survey research may enhance the generalizability or external validity of the study by providing a broad sample of user organizations from a variety of geographical locations (Young, 1992).

This survey approach was determined as appropriate for the following reasons:

1. to gather a large amount of data from multiple organizations
2. to test a UIS/IS-SERVQUAL instrument which measures the success of a support organization
3. to determine individual differences in respondents
4. to obtain data about industry support organizations and their success
5. to determine which organizational support structure performs the best for individual user types
6. a large number of uncontrolled variables are interacting unpredictably
7. the population is made up of a wide range of variables and characteristics

Possible limitations of using the survey approach include:

1. poor response rate (sample size determination)
2. bias introduced in the survey instrument
3. distortion of the truth by respondents (self-reporting)
4. location bias
5. invalid/unreliable survey questions
6. unknown respondents (i.e., is the right person answering the questionnaire)

Statistical Hypotheses

Ten specific statistical hypotheses were identified from the research questions. Each hypothesis relates directly to the stated research question. Both the null and alternative hypothesis are presented for each hypothesis. The null hypothesis is simply the hypothesis of "no difference" or "no relationship" existing between variables.

H_{o1}: There is no effect on service quality by method of support across user types.
H_{A1}: Method of support affects service quality across user types.

H_{o2}: There is no effect on service quality by location of support staff across user types.
H_{A2}: Location of support staff affects service quality across user types.

H_{o3}: There is no effect on service quality by type of support across user types.
H_{A3}: Type of support affects service quality across user types.

H_{o4}: There is no effect on service quality by the support technician's level across user types.
H_{A4}: The support technician's level affects service quality across user types.

H_{o5}: There is no effect on user satisfaction by method of support across user types.
H_{A5}: Method of support affects user satisfaction across user types.

H_{o6}: There is no effect on user satisfaction by location of support staff across user types.
H_{A6}: Location of support staff affects user satisfaction across user types.

H_{o7}: There is no effect on user satisfaction by type of support across user types.
H_{A7}: Type of support affects user satisfaction across user types.

H_{o8}: There is no effect on user satisfaction by the support technician's level across user types.
H_{A8}: The support technician's level affects user satisfaction across user types.

H_{o9}: There is no relationship between system type and user satisfaction.
H_{A9}: A relationship exists between system type and user satisfaction.

H_{o10}: There is no relationship between system type and service quality.
H_{A10}: A relationship exists between system type and service quality.

Instrument Design and Validation

This study incorporated a four-section survey instrument, Appendix A. The instrument, as previously noted, was designed from prior UIS and service quality literature. In addition to the previous two sections on satisfaction measures and service quality measures, the instrument contains a section for demographics (individual differences) and a section with open-ended questions relating to the support function. Specifically, a modified version of the Doll and Torkzadeh (1988) UIS instrument and a combination of the Kettinger and Lee (1994) and Maples (1997) IS-SERVQUAL instruments are the models for the modified research instrument. Questions were

modified in order to capture data for all variables of interest as suggested by several authors in the literature review (Baroudi and Orlikowski, 1988; Carman, 1990; Brown, Chruchill and Peter (1993); Kappelman, Van Dyke and Prybutok, 1995; Maples, 1997). As this research project was concerned with the success of the support organization, many of the questions contained in each of the previous studies did not apply to this research and as such, were not included. Additionally, the format and some measures of content were changed to fit this research.

Validity threats categorized by Cook and Campbell (1979) that should be addressed include: history, maturation, testing instrumentation (face and content), statistical regression, selection, mortality, interactions with selection and ambiguity about the direction of causal influence. Since this is survey research there will be no interaction with the respondents by the researcher. Compensatory equalization of treatments, compensatory rivalry and resentful demoralization (Cook and Campbell, 1979), do not apply to this research.

History, maturation and mortality are not threats because of the type of research; the survey is only applied once to a subject. Also, the short time frame of data collection would remove any additional threat due to history or maturation.

To improve testing instrumentation, face validity, and content validity, of the instrument, a panel of experts consisting of three IS support personnel, one IS support manager and one IS faculty member was constructed (Appendix C). The expert panel

reviewed and revised the questions, the sections, and the layout of the questionnaire. As instructed, they addressed the topics of readability, clarity, consistency and reliability.

The panel determined that only one version of the instrument was necessary for all respondents, rather than administrating one version of the instrument to information systems professionals and a separate version of the instrument to end-users. The rationale for this decision came from the demographics section, which included questions necessary for determining the type of user responding to the survey instrument. The panel addressed construct validity by confirming, in their opinion, that the survey questions measured what they were expected to measure: satisfaction and quality of information systems support.

Pilot Study Data Collection

An initial pilot study to test the instrument was conducted using employees in two divisions of AMR Corporation, American Airlines and Sabre Incorporated. These divisions of AMR were known to have several internal support organizations, and agreed to allow the researcher access to the employees. Sabre Incorporation continued to be a sponsor for the research project by providing mailing and copying services.

Pilot testing is necessary to:

1. evaluate the readability and understanding of the directions
2. evaluate the length of the instrument
3. evaluate the completeness of the instrument
4. ensure that the items measure the constructs (user satisfaction, service quality, individual differences)
5. determine the reliability of the scales
6. obtain the sample mean and variance needed for use in determining the minimum sample size for the project

Results from the pilot study showed that the directions for filling out the questions needed to be more specific, i.e., mark one answer only. In addition, it was noted that the reverse coding used in the design of the instrument was confusing to the respondents. As a result the questionnaire was redesigned to remove the reverse coding in the final version used in the main study.

Pilot Study Results

As previously mentioned, the survey instrument (presented in Appendix A) was distributed by internal representatives of the support department at two divisions of AMR Corporation: American Airlines and Sabre Incorporated. One hundred and twenty survey instruments were distributed, 60 for each division. A total of 55 completed responses were returned from both companies giving a response rate of 45%. Because ten of the responses were incomplete in many respects, they were excluded from analysis. This gave a final response rate of 36% for the pilot study.

Table 9 presents the frequency counts of the user-types from the pilot study. The user types are not evenly distributed. This may lead to unbalanced cells in the experimental design. In addition, this is not consistent with some of the earlier literature findings showing balanced numbers of user types in their surveys.

Table 9: User type of pilot respondents

User Type	AA	Sabre
Nonprogrammer	6	3
Command level user	0	1
End-user programmer	3	3
Functional Support	2	2
End-user Support	3	2
Technical Support	8	7
Data Processing Programmer	3	2

One-way ANOVA tests were performed to assess differences between employee responses from the two companies, with respect to service quality and user satisfaction. Table 10 displays the results of the ANOVA on the variable service quality. There was a significant difference between companies (p-value of 0.028) with respect to the quality measure.

Table 10: ANOVA comparison of service quality between AA and Sabre

Source of variance	DF	ANOVA Sum of Squares	Mean Square	F-value	Pr > F	ω^2
Between Groups	1	10.30604178	10.30604	5.160653	0.028289	0.086391
Within Groups	43	83.87577	1.997042			
Total	44	94.181818				

Table 11 gives the results in regard to the satisfaction measure. As shown there was not a significant difference (p-value of 0.498) at the .05 significance level. The differences in the opinion of the American Airlines respondents as compared to the Sabre Incorporated respondents with regard to service quality provided by the support organization, may be attributed to the user types. Sabre Incorporated employees are

Information Systems professionals, and as such, understand many of the issues involved with support. They do not have unreasonable expectations in regard to the support they receive. That is, they may have an understanding and insight to many of the problems that arise during the support process. While, perhaps, the AA employees do not have this insight, and therefore have higher expectations of the support staff.

Table 11: ANOVA comparison on user satisfaction between AA and Sabre

Source of variance	DF	ANOVA Sum of Squares	Mean Square	F-value	Pr > F	ω^2
Between Groups	1	817.0473	817.0473	0.466274	0.498456	0.012279
Within Groups	43	73596.11	1752.288			
Total	44	74413.16				

For method of support, 25 of the 45 respondents selected the help desk as the method most used for support. Company policy requires that the users contact the help desk before any attempt is made to correct a problem. Therefore, we did not change the survey instrument with regard to method of support.

After obtaining results of the pilot study and polling selected respondents of the pilot study, the expert panel determined that a few changes were necessary on the survey instrument. First, the directions for completing the questionnaire needed to be more specific (i.e., Please mark one answer only). In addition, the reverse coding used in the design of the instrument was confusing to the respondents. As a result the questionnaire was redesigned to remove the reverse coding of the questions and give more detailed instructions to the recipients of the survey instrument.

Main Study Data Collection and Sample Size

Distribution of the final instrument was done from a random sample of 30 firms. The requirements were that the organization had an internal support organization or purchased support from another firm. Additionally, an electronic copy of the instrument was placed on a web site to obtain data interactively. E-mail messages were sent to MIS managers of additional firms requesting help in filling out the electronic version of the instrument.

The point of contact in each of the firms was the MIS manager, specifically the MIS manager in charge of the support function or organization within MIS, or a designee. In a letter of instruction and introduction (see Appendix B), the MIS manager was asked to randomly distribute 20 copies of the instrument to users of support and various MIS programmers or support technicians within the organization. This brought the population sampled to 600. These users are a mix of MIS staff and end users, as all MIS staff are also users of some type of IS support. Respondents responded either electronically or by mail.

In survey research, especially mass mailing, the number of returned and usable responses are typically much lower than that of those requested. According to Baroudi and Orlikowski (1989), a purposeful sample increases the statistical power of the study. Refer back to Table 6, chapter 2, for a presentation of the sample sizes used in prior research studies using similar instruments. Previous studies were conducted using sample sizes ranging from a low of 32 respondents using the UIS instrument (Bailey and Pearson,

1983) to a high of 689 respondents using the SERVQUAL instrument (Babakus and Boller, 1992).

Summary

This chapter described how the research project was conducted. It included the rationale for the selection of the research design, and provided an explanation of the implementation of the design. The statistical hypotheses are identified and related back to the research questions. A discussion followed on designing the instrument and validating its content using an expert panel and a pilot study. Additionally, the rationale data collection procedures and results for the pilot study were presented. Data collection procedures for the main study concluded the chapter, followed by a discussion of sample sizes from previous studies.

CHAPTER V

ANALYSIS AND RESULTS

Overview

The results of the statistical analysis performed in this study are reported in this chapter as well as a discussion of that analysis. A summary of the respondents' demographic information is followed by the tests of the hypotheses for dependent variables.

As a final note, a comparison analysis between the pilot study, main distribution and the interactive web-based survey is reported. One-way analysis of variance was used to examine differences among the three responded groups, concluding the chapter.

Main Study Participants

In addition to the pilot study, 30 additional firms were contacted. The firms that were contacted represent a cross section of industries and were known either to have an aggressive support center or to contract out for support. Additionally, those that were contacted were from several geographic areas; however, those that responded have their headquarters in one of two geographic areas; the southwest and the midwest. It should be noted that most of the firms that responded to the request are from multinational firms, and as such, it is possible that questionnaires were completed by someone outside of the geographical areas.

The firms that elected to participate and responded to the request are presented in

Table 10. Thus, 33% of the companies contacted actually participated in the study. However, the response rate within the companies that participated varies widely. From a low of 5% (one survey out of 20 was returned from Motorola) to a high of 80% (16 out of 20 returned from Northrup/Grumman).

Table 12: Companies that participated in the study

Company	Code	Returned	% Ret
AEGIS Communications Irving, TX	K	9	45
Motorola Chicago, IL	I	1	05
Neiman Marcus Retail Las Colinas, TX	N	11	55
Northeastern Illinois University, Chicago, IL	U	7	35
Northrup/Grumman Grand Prairie, TX	B	16	80
Sterling Communications * Los Colinas, TX	G	11	55
Sterling Software * Dallas, TX	F	15	75
Southwest Airlines Dallas, TX	Y	10	50
TeleService Resources Ft. Worth, TX	T	6	30
University of North Texas, Denton, TX	U	14	70
Various Companies Web-based Survey	W	15	N/A
Total		115	

- Note: Sterling Communications and Sterling Software are not associated.

The total number of surveys returned was 115, representing a 19% response rate.

This rate of return is not unusual in business survey research. Of those surveys returned in the main study (excluding the pilot study), 110 were usable, which results in an 18.33% total response rate. The increase of usable responses may be attributed to the revision of the survey instrument. Combining the pilot study results with the main study, the final response rate for this research effort comes to 21.38%. The following analysis includes the pilot and main study results.

Respondent Demographics

Demographic data were collected in the first two sections of the survey instrument. Respondents' demographic information for age, gender, education, years in the same job and years with the company are summarized in Table 13. As shown, respondents varied greatly in the collected demographics. Of the demographic variables, gender was most evenly distributed with males comprising 54% of the respondents and females 46%. The most common age group of respondents was 36-42 (26%), followed by 26-30 (23%), 31-34 (20%), 25-under (15%), 43-50 (8%), and 51-above (8%). Almost 33% of respondents had less than two years of college or no college at all. Respondents with 4-year college degrees comprised 31% of the total sample. This left 34% with some graduate work or a Masters degree and 5% with college experience above the Master degree.

Additionally, data for experience in the job and length of employment were also captured. With regard to experience in the job, the majority of respondents (69%) had less than five years in the same job, followed by 6-10 years in the job (17%), 11-20

(10%), and finally 4% with 21 or more years in the same job.

Table 13: Respondent demographic information level.

Variable	Number of Subjects	%
Age		
Less than 21	2	01.29
21-25	22	14.19
26-30	35	22.58
31-35	31	20.00
36-42	40	25.81
43-50	13	08.39
51-60	10	06.45
over 60	2	01.29
Total	155	100%
Gender		
Male	83	53.55
Female	72	46.45
Total	155	100%
Education		
12 and below	7	04.52
13-14	44	28.39
15-16	49	31.61
17-18	48	30.97
above 18	7	04.52
Total	155	100%
Years in Job		
Under 5	107	69.03
6-10	27	17.42
11-20	15	09.68
21 and above	6	03.87
Total	155	100%
Years with the Company		
Under 5	69	44.52
5-10	10	06.45
11-20	40	25.81
21 and above	36	23.23
Total	155	100%

When evaluating the employee's time with the company, the respondents

followed a very different pattern than the time-in-job variable. The majority of respondents (44%) were still in the less than five years category, but this was where the pattern shifts greatly. The 6-10 year category had only 6% of the respondents, while the 11-20 category contained 26% of respondents, followed by the 21 or more years in the same company category with 23% of all respondents. From these frequency counts, it can be determined that the older respondents stay with the company, while the younger respondents seem to move around more.

Organizational Demographics

Organizational demographics were collected in the initial section of the questionnaire. The variables collected were industry type, company size, and demographic structure of the organization. These variables are shown in Table 14 below.

The two organizational types that were tied for the highest response rate of 23% each were those used in the pilot study. One belongs to the transportation industry, while the other is a technology company. However, other company responses are included in this 23%. Of the other industry types that participated, educational institutions contributed 13.5% of the responses, followed by manufacturing which comprised 10% of the total responses. Additional organizational types that contributed to the total responses are communications (8.4%), e-commerce (8%) and retail (6.5%). All other organizational types contributed 7.7% of the total responses.

Table 14: Organizational demographic information

Variable	Number of Subjects	%
Industry type		
Communications	13	08.39
E-commerce	11	07.97
Education	21	13.55
Manufacturing	16	10.32
Retail	10	06.45
Technology	36	23.23
Transportation	36	23.23
Other	12	07.74
Total	155	100%
Company Size (number of employees)		
15 or less	2	01.29
16-500	10	06.45
501-5000	56	36.13
over 5000	87	56.13
Total	155	100%
Domestic or International		
Single site	19	12.26
Multiple domestic sites	47	30.32
International	14	09.03
Multinational	75	48.39
Total	155	100%

In regard to company size, an overwhelming majority of responses came from employees in organizations with over 5000 employees (56%). The next category, 501 to 5000 employees, composed 36% of the responses. Only 10 responses (6.5%) came from organizations with 16-500 employees and the low of only 2 responses (1%) came from organizations with less than 15 employees. With only 2 responses, this category is under represented and as such the results of the research may not be generalizable to include support functions in small companies.

When evaluating organizational structure, the majority of the responses came from multinational firms, with 75 respondents making up 48% of the total responses,

while, responses from organizations with multiple domestic sites was 30% of the total responses. Of the remaining two organizational structure categories, 19 respondents (12%) work at organizations that have a only a single site, while the remaining 14 respondents (9%) work at international organizations.

User Types

User type is the moderating variable for many of the research questions. Table 15 shows the number of responses received for each user type. During the literature study, in evaluating the user type, two additional user types were added to the Rockart and Flannery (1983) classification scheme (nonprogramming-illiterate and technical support). After looking at the results of the respondents, it is clear that instead of adding user types, they should be re-categorized, as there is too much variation in the sizes of the cells.

Table 15: Self-reported user type

User Type	Number
Nonprogrammer – Illiterate	5
Nonprogrammer – Literate	53
Command level user	12
End-user programmer	13
Functional Support	11
End-user Support	10
Technical Support	23
Data Processing Programmer	28

The resulting user types are shown in Table 16. The first categories combined are nonprogrammer – illiterate and nonprogrammer – literate to form a user type of "non-IS

professional/nonprogrammer." The second category formed is "end-user professional," which includes the user types end-user programmer, end-user support and command level user. The final category formed is "Information System professional." This category consists of the functional support professional, the technical support personnel and the data processing programmer user types.

Table 16: Combined user type

User Type	Coded	Number
End-user professional	0	35
Non-IS professional/Nonprogrammer	1	58
Information System Professional	2	62

Independent Variables

The frequencies of the categories for each of the five independent variables of interest were examined to determine which cells were under represented. The initial categories for the independent variables are listed in Table 7 in chapter 3. As with user type, it was necessary to collapse some of the variable scales to provide more evenly distributed cell sizes. Table 17 provides a list of the independent variables and the revised coding for each.

Table 17: Independent variables coded for analysis

Variable	Description	# Obs
System Type	0 – purchased software 1 – developed software 2 – communications/mainframe	50 51 54
Method of Support	0 – help desk/on-line support 1 – all other methods, local, centralized or IC	77 78
Support Technician's Level	0 – helpdesk (beginner/some experience) 1 – advanced technical support (engineering)	95 60
Location of support staff	0 – non-local Support 1 – local support	58 97
Type of Support	0 – regular maintenance 1 – infrastructure/advanced troubleshooting 2 – software support	52 62 41

The variable system type was reduced from nine cells to three. The first system type is "purchased software," which includes purchased software, both shrink-wrapped and developed specifically for the company. The second system type is "in-house developed software," which includes client/server and LAN based applications. The final grouping for system type is "communications and mainframe software." This includes any generic communications packages, intranet/internet software, e-mail and any mainframe software.

The second variable whose categories were collapsed was method of support. Of the respondents, many more selected either the help desk or local MIS support than the other categories. This made it necessary to reduce this variable from the initial six cells to the final two categories of "help desk/on-line help" and "all other methods of support."

As with method of support, the support technician's level was summed to two categories. Of all the levels of the support technician, help desk technician was selected the most. As this study is interested in support beyond the help desk, the variable was categorized as "help desk/beginner or some experience" and "advanced technical support," which includes engineers as well.

Location of support staff is the next variable of interest. If the support staff were located locally and could provide personal support they were placed in one category. If the support staff were located elsewhere they were placed in the non-local category.

The final variable of interest was type of support. This variable relates to the type of support provided, that is, hardware, software, consulting, training, virus protection, etc. This variable was summed up into three categories, "regular maintenance," "software support" and "advanced technical support/troubleshooting." Regular maintenance includes acquisition and deployment of hardware/software, backups, virus protection, how-to questions, and training. Software support is any software specific support and consists of e-mail support, end-user consulting, application development software, and software integration. The final category, advanced technical support/troubleshooting, consists of infrastructure support, network support, platform support, data flow issues and any other advanced technical support functions including troubleshooting. This category is necessary because we are interested in advanced support issues.

Factor Analysis of the Satisfaction Variable

Responses to questions from the user information satisfaction (UIS) section of the

instrument were analyzed using principal component factor analysis with a varimax rotation. A reduced set of 45 questions are used since questions on the Doll and Torkzadeh (1988) UIS instrument not relevant to the support function were omitted. Results of the principal components factor analysis yielded a single factor explaining over 55% of the variation. The next closest only explained 4.6% and a third factor explains only 4.08% of the variance; therefore, using the scree plot only one factor was retained. Details of the factor analysis are presented in Appendix D.

Table 18 displays the loading of each of the questions on the satisfaction factor. Type of questions that load onto the satisfaction factor were related to how the support staff interacts with users, the technical competence of the support staff, and the general satisfaction with the support and service. Questions regarding hardware and software of the computer systems did not load onto this factor. Perhaps the respondents view the maintenance of hardware and software to be separate from technical support. The Cronbach's alpha coefficient for the satisfaction factor was .97, thus showing a high degree of reliability for this factor.

Table 18: Satisfaction questions and their loadings

#	Load	Question Heading	Question

1	0.53388	Support personnel are:	Sensitive to your needs
2	0.50385		Explain things well
3	0.62109		Excellent listeners
4	0.69917		Understand your problem
5	0.50436		Understand your job
8	0.57832		Very reliable
9	0.74156		Very effective
10	0.70626		Very efficient
11	0.78130		Well trained
19	0.75400	In general, the support staff know the answer to:	Knows about applications
20	0.72972		Specific system questions
21	0.69388		a variety of questions
29	0.57554	The general attitude of the support staff is:	Consistent
30	0.55820	How likely are you to use the support staff again:	Definitely will
31	0.73909	The technical competence of the support staff is:	up-to-date
32	0.78230		Sufficient
33	0.74439		Superior
34	0.65009		Always meets my needs
41	0.62733	In general how satisfied are you with:	the support staff
42	0.61049		With your last service
43	0.65235		With your technician
44	0.62679		Service delivery

Factor Analysis of the Service Quality Variable

Similar to the analysis of the satisfaction measures, a principal components factor analysis using a varimax rotation was used to investigate the quality dimension. As with the analysis of all service quality data, using the SERVQUAL instrument, the gap between user expectations and the users' perceived organizational performance is the unit of measure used. Table 19 presents the quality questions and their loadings.

Of the service quality questions, eleven out of the 15 loaded on a single factor. This factor measures the quality of the support function and explains 50% of the variance of the responses. As with the satisfaction data, the next nearest factor explained much less (only 8% of the variance). The scree test was used to verify that one was the optimum number of factors that should be used. The scree plot indicates that the number of factors

to be retained is one. The point at which the eigenvalue curve levels off is the point that indicates how many factors to retain. Details of the factor analysis are located in Appendix D. The Cronbach's alpha coefficient was found to be .92, thus showing high reliability for the quality factor.

Table 19: Service quality questions with corresponding loading

#	Load	Service Quality Question Heading
55	0.65492	Provides up-to-date equipment
57	0.77786	When a promise is made to do something by a certain time, that promise is kept.
58	0.62673	Employees will be consistently courteous with users.
59	0.73036	The behavior of IS employees will instill confidence in users.
60	0.57199	Employees give prompt attention to users.
64	0.60008	Employees are always willing to help users.
65	0.52548	Employees have the skills to solve the users' problems.
66	0.78588	Employees are reliable.
67	0.63673	Employees have the best interest of the users at heart.
68	0.57887	When a user has a problem, a sincere interest is shown in solving it.
69	0.66301	Employees have the knowledge to answer the users' questions.

Analyzing Hypotheses I Through IV Concerning Service Quality

To analyze hypotheses I through IV, a two-way analysis of variance (ANOVA) was performed with service quality as the dependent variable. The variable, user type, was a moderating variable in each model. A .05 level of significance was used in testing these hypotheses. Whenever the p-value was less than .05 in the ANOVA results, Tukey's multiple comparisons of means test was performed to provide additional analysis into the differences. Mendenhall and Sincich (1993) presents a modification of the Tukey's method for use with unequal sample sizes (p. 628). This formula is used to calculate Tukey's because the sample sizes for this data are unequal. As this procedure is approximate for the case of unequal sample sizes, the value of alpha (here .05) provides

an approximation of the true probability of making one or more Type I errors.

Stevens (1996) states that that a valid effect size measure is the use of η^2. However, Hinkle, Wiersma and Jurs (1998) believe that a better measure to use in the evaluation of effect size is ω^2. They state "when used appropriately, ω^2 can provide useful information about the association between the dependent variable and the levels of the independent variable." Even if the *F*-ratio in an ANOVA is very large, a modest ω^2 may be found. If this is the case, caution should be used not to overinterpret the significance of he results (Hinkle, Wiersma and Jurs, 1998). The value of the ω^2 is interpreted as a percentage of the association. Omega squared is reported for each of the variables.

Hypothesis I

The first hypothesis is used to investigate research question 1: *Does a relationship exist between service quality and method of support taking into consideration user type?* The null hypothesis is as follows: H_{o1}: There is no effect on service quality by method of support across user types.

As presented in Table 20, since the interaction between method of support and user type was significant with a p-value of 0.04, Tukey's multiple comparison procedure was used.

Table 20: ANOVA results for H_{o1}

Source	DF	ANOVA Sum of Squares	Mean Square	F-value	Pr > F	ω^2
Method of support	1	0.05151945	0.05151945	0.06	0.8135	0.0057227

User Type	2	6.83994928	3.41997464	3.71	0.0269 *	0.0329952
Interaction	2	6.06348184	3.03174092	3.29	0.0401 *	0.0278656
Error	149	137.430584	0.9227556			
Total	154	150.445535				

- significant at the .05 level
-

Table 21 presents the results of the Tukey's multiple comparison procedure. A significant difference at the .05 level exists between the means of the category Information System professional/help desk and the category end-user professional/help desk. Additionally, the category Information Systems professional/non-help desk was significantly different from end-user professional/help desk. This additional support leads us to reject the null hypothesis.

Table 21: Tukey's results for user type/method of support interaction

Tukey Groupings		Treatment pair (i,j) **	Mean	N
A		2,0	0.4750000	40
A		2,1	0.5082645	22
A	B	0,1	0.5909091	16
A	B	1,0	0.6411483	19
A	B	1,1	0.8554779	39
	B	0,0	1.3875598	19

** see tables 16 and 17 for descriptions of cells

Hypothesis II

The second hypothesis is used to investigate research question 2: *Does a relationship exist between service quality and location of support staff taking into consideration user type?* The null hypothesis is as follows: H_{o2}: There is no effect on service quality by location of support personnel across user types.

Table 22 illustrates that the interaction of the two variables is not significant at the .05 level. In addition, the treatment variable location of support is not significant since its p-value is 0.3806. Therefore, we fail to reject the null hypothesis.

Table 22: ANOVA results for H_{o2}

Source	DF	ANOVA Sum of Squares	Mean Square	F-value	Pr > F	ω^2
Location of support staff	1	0.73625676	0.73625676	0.77	0.3806	0.0014247
User Type	2	6.83994928	3.41997464	3.59	0.0299 *	0.0326032
Interaction	2	1.02902536	0.51451268	0.54	0.5836	0.0057787
Error	149	141.840303	0.95194830			
Total	154	150.445535				

* significant at the .05 level

The ANOVA reported a p-value of 0.0299 for the moderating variable user type. As this is significant, Tukey's multiple comparison procedure was performed to test the differences between the means of the three user types against the quality dimension. Table 23 presents the results of this comparison. The user type, end-user professional, showed a significant difference in the means between the other two user types; non-IS professional/nonprogrammers and IS professionals. This is consistent with the analysis in hypothesis II.

Table 23: Tukey's results for user type

Tukey Groupings	Treatment (I) **	Mean Difference	N

A		0	0.2381	35
	B	1	0.5366	58
	B	2	0.2985	62

** see table 16 for a description of cells

Hypothesis III

Hypothesis III is used to investigate research question 3: *Does a relationship exist between service quality and type of support taking into consideration user type?* The null hypothesis is as follows: H_{o3}: There is no effect on service quality by type of support across user types.

Table 24 presents the results of the two-way ANOVA for Hypothesis III. The type of support variable reported p-value of 0.8135, which is not significant. As with the first two models, the variable user type was significant with a p-value of 0.0264. Again, the interaction between the variables was not significant, with a reported p-value of 0.1678. Therefore, we fail to reject the null hypothesis.

Since the moderating variable, user type, was significant, it would be appropriate to perform Tukey's multiple comparison procedure to test for differences in the means. As we performed the procedure on this variable in the section for hypothesis II with exactly the same results, it is not necessary to recalculate the results using Tukey's procedure. For the results of the previous calculations, see Table 23.

Table 24: ANOVA results for H_{o3}

Source	DF	ANOVA Sum of Squares	Mean Square	F-value	Pr > F	ω^2
Type of						

support	2	3.63317442	1.81658721	1.98	0.8135	0.1187937
User Type	2	6.83994928	3.41997464	3.73	0.0264 *	0.0330654
Interaction	4	6.01186916	1.50296729	1.64	0.1678	0.0154709
Error	146	133.960542	0.91753800			
Total	154	150.445535				

* significant at the .05 level

Hypothesis IV

The fourth hypothesis is used to investigate research question 4: *Does a relationship exist between service quality and the support technician's level taking into consideration user type?* The null hypothesis is as follows: H_{o4}: There is no effect on service quality by support technician's level across user types.

Table 25 presents the results the analysis. The two-way ANOVA yielded a p-value of 0.0283 for the support technician's level, which was significant at the .05 level. Therefore, the support technician's level affects the users' perception of service quality.

Table 25: ANOVA results for H_{o4}

Source	DF	ANOVA Sum of Squares	Mean Square	F-value	Pr > F	ω^2
Support technician's Level	1	4.59354090	4.59354090	4.90	0.0283 *	0.0241552
User Type	2	6.83994928	3.41997464	3.65	0.0283 *	0.0328057
Interaction	2	0.00000000	0.00000000	0.00	1.0000	0.0123775
Error	149	139.593166	0.93686690			
Total	154	150.445535				

* significant at the .05 level

Again, user type was significant with a p-value of 0.0283. However, the interaction gave a p-value of 1.0, which shows no interaction exists between the two variables.

Because the variable (support technician's level) was significant, Tukey's multiple comparison procedure was performed. The procedure results shown on Table 26 reported a significant difference between the means of the groups. The first group, entry level/some experience, had a mean value of 0.8565, while the second group, advanced technical support/engineers, had a mean value of .5030. As these means are significantly different, Tukey's provides additional proof for rejecting the null hypothesis. Again the moderator variable was shown to be significant. For results of Tukey's procedure for the moderator variable, see Table 23 in the hypothesis II discussion.

Table 26: Tukey's results for support technician's level

Tukey Groupings		Treatment (i) **	Mean	N
A		0	0.8565	95
	B	1	0.5030	60

** see table 17 for descriptions of the cells

Analyzing Hypotheses V Through VIII Concerning User Satisfaction

As with the hypotheses relating to service quality, Hypotheses V through VIII were analyzed using a two-way analysis of variance (ANOVA). This time, user satisfaction was used as the dependent variable. Again, the variable, user type, was used as a moderating variable in each of the models. A .05 level of significance was used in testing these hypotheses. Tukey's test for differences in the means was performed whenever significance in the variables was reported. As with the analysis of hypotheses I through IV, the value of ω^2 is reported for each of the variables. The results of the analysis of each of the hypothesis are addressed separately and presented in Tables 27-28,

30-31.

Hypothesis V

Hypothesis V is used to investigate research question 5: *Does a relationship exist between user satisfaction and method of support taking into consideration user type?* The null hypothesis is as follows: $H_{o5:}$ There is no effect on user satisfaction by method of support across user types.

As presented in Table 27, the two-way ANOVA yielded a p-value of 0.8173 for method of support, which was not significant at the .05 level. Unlike the analysis for service quality, user type was not significant with a p-value of 0.7377. In addition, the p-value for the interaction between the two variables was reported at 0.3465, which was also not significant. Therefore, we fail to reject the null hypothesis.

Table 27: ANOVA results for H_{o5}

Source	DF	ANOVA Sum of Squares	Mean Square	F-value	Pr > F	ω^2
Method of support	1	0.07019857	0.07019857	0.05	0.8173	0.0061941
User Type	2	0.79925576	0.39962788	0.30	0.7377	0.0090985
Interaction	2	2.79806401	1.39903201	1.07	0.3465	0.0008815
Error	149	195.303636	1.31076270			
Total	154	198.9711544				

Hypothesis VI

The sixth hypothesis is used to investigate research question 6: *Does a relationship exist between user satisfaction and location of the support staff taking into consideration user type?* The null hypothesis is as follows: $H_{o6:}$ There is no effect on user

satisfaction by location of service personnel across user types.

Results of the two-way ANOVA are presented in Table 28. The model yielded a p-value of 0.0018 for location of support staff, which was significant at the .05 level. Therefore, we reject the null hypothesis; there is an effect on user satisfaction by location of support staff. The variable user type is again not significant with a p-value of 0.7251. Additionally, the interaction between the two variables was not significant with a reported p-value of 0.7031.

Table 28: ANOVA results for H_{o6}

Source	DF	ANOVA Sum of Squares	Mean Square	F-value	Pr > F	ω^2
Location of support staff	1	12.47125094	12.47125094	10.05	0.0018 *	0.0560947
User Type	2	0.79925576	0.39962788	0.32	0.7251	0.0083992
Interaction	2	0.87593349	0.43796674	0.35	0.7031	0.0080192
Error	149	184.824714	1.24043430			
Total	154	198.9711544				

* significant at the .05 level

Tukey's multiple comparison procedure was performed to verify that the mean values were significantly different. Table 29 reports the results of this procedure. At the .05 level of significance, the mean of the non-local support group was 4.7437, while the mean of the local support group was 5.3299. This demonstrates that individuals that have access to a local technical support person, are much more satisfied with the support given, than those that do not.

Table 29: Tukey's results for location of support staff

Tukey Groupings		Treatment (i) **	Mean	N
A		0	5.3299	97
	B	1	4.7437	58

** see table 16 for descriptions of cells

Hypothesis VII

Hypothesis VII is used to investigate research question 7: *Does a relationship exist between user satisfaction and type of support taking into consideration user type?* The null hypothesis is as follows: $H_{o7:}$ There is no effect on user satisfaction by type of support across user types.

The ANOVA yielded a p-value of 0.7368 for the variable type of support as reported in Table 30. Since no significance exists, we fail to reject the null hypothesis, and thus conclude that type of support has no effect on user satisfaction. Again, adding the moderating variable, user type, into the equation, with a reported p-value of 0.7394, does not change the significance and the result is the same, we fail to reject the null hypothesis. Additionally, the interaction between the two variables was not significant, yielding a p-value of 0.4979.

Table 30: ANOVA results for H_{o7}

Source	DF	ANOVA Sum of Squares	Mean Square	F-value	Pr > F	ω^2
Type of support	2	0.80878493	0.41439247	0.31	0.7368	0.0091543
User Type	2	0.79925576	0.39962788	0.30	0.7394	0.0092019
Interaction	4	4.47349675	1.11837419	0.85	0.4979	0.0040498
Error	146	192.8896000	1.3211618			
Total	154	198.9711544				

Hypothesis VIII

Hypothesis VIII is used to investigate research question 8: *Does a relationship exist between user satisfaction and the support technician's level taking into consideration user type?* The null hypothesis is as follows: H_{o8}: There is no effect on user satisfaction by the support technician's level across user types.

Hypothesis VIII, was also tested with the two-way ANOVA procedure as presented in Table 31. This analysis yielded a p-value of 0.0004 for the support technician's level, which was significant at the .05 level. Therefore, as with service quality, the support technician's level affects user satisfaction. User type, however, was not significant with a p-value of 0.7142, and the interaction between user type and the support technician's level was not significant since the p-value is 0.0899.

Table 31: ANOVA results for H_{o8}

Source	DF	ANOVA Sum of Squares	Mean Square	F-value	Pr > F	ω^2
Support technician's level	1	15.84550371	15.84550371	13.37	0.0004 *	0.0732468
User Type	2	6.83994928	0.39962788	0.34	0.7142	0.0223350
Interaction	2	5.80121661	2.90060830	2.45	0.0899	0.0132032
Error	149	176.525178	1.1847327			
Total	154	198.9711544				

* significant at the .05 level

As with the previous significant variables, Tukey's multiple comparison procedure was performed. Table 32 shows the results of the procedure on support technician's level and reported a significant difference between the means of the groups. The first group, entry level/some experience, had a mean value of 4.8565, while the second group, advanced technical support/engineers, had a mean value of 5.5129. As these means are significantly different, Tukey's provides additional proof for rejecting the null hypothesis, and the conclusion is drawn that there is an effect on user satisfaction by the support technician's level.

Table 32: Tukey's results for support technician's level

Tukey Groupings		Treatment (i) **	Mean	N
A		0	4.8565	95
	B	1	5.5129	60

** see table 16 for descriptions of cells

Analyzing Hypothesis IX and X Concerning the Independent Variable System Type

Hypothesis IX

The final variable to analyze in regard to user satisfaction was system type. Hypothesis IX is used to investigate the research question: *What is the relationship between system type and user satisfaction?* The null hypothesis is as follows: H_{o9}: There is no relationship between system type and user satisfaction.

A one-way ANOVA was performed on the data. The results are presented in Table 33. The reported p-value for this test was 0.4194, which is not significant. Therefore, we fail to reject the null hypothesis, and cannot conclude that there is a relationship between system type and user satisfaction.

Table 33: ANOVA results for H_{o9}

Source	DF	ANOVA Sum of Squares	Mean Square	F-value	Pr > F	ω^2
System Type	2	2.26251637	1.13125819	0.87	0.4193	0.0016266
Error	152	196.708638	1.29413580			
Total	154	198.971154				

Hypothesis X

As with user satisfaction, system type is the final variable to analyze for service quality. The research question under investigation by Hypothesis X is as follows: *What is the relationship between system type and service quality?* The null hypothesis states: $H_{o10:}$ There is no relationship between system type and service quality.

Again a one-way ANOVA was conducted. Table 34 presents the results of the analysis. The model reported a p-value of 0.2313. Therefore, we fail to reject the null hypothesis.

Table 34: ANOVA results for H_{o10}

Source	DF	ANOVA Sum of Squares	Mean Square	F-value	Pr > F	ω^2
System Type	2	2.87078129	1.43539064	1.48	0.2313	0.0.0061355
Error	152	147.574753	0.9708865			
Total	154	150.445535				

ANOVA Comparisons of the Treatment Groups

Three data collection methods were implemented in this study. The first was the pilot study, which was conducted by the researcher at the individual company sites. The second method was through the mail, using a company employee to distribute and collect the responses and then return them to the researcher. The third method was with an electronic survey instrument on the web. A one-way ANOVA was conducted to determine if a significant difference between data collection methods existed. Analysis was conduced with a .05 level of significance. Table 35 presents the results of the analysis on the dependent variable user satisfaction. With a reported p-value of 0.1537 it can be concluded that no significant difference exists between the data collection method respondents with regard to the variable user satisfaction.

Table 35: ANOVA results data collection method comparison on user satisfaction

Source of variance	DF	ANOVA Sum of Squares	Mean Square	F-value	Pr > F	ω^2
Between Groups	2	9008.356	4504.178	1.895513	0.153753	0.011351
Within Groups	153	363563.4	2376.231			
Total	155	372571.7				

Table 36 displays the results of the ANOVA performed on the data collection treatment methods for the dependent variable service quality. It can be concluded that no significance difference exists between the data collection methods since the p-value is reported at 0.7952.

Table 36: ANOVA results data collection method comparison on service quality

Source of variance	DF	ANOVA Sum of Squares	Mean Square	F-value	Pr > F	ω^2
Between Groups	2	0.698928	0.349464	0.229497	0.795208	0.010042
Within Groups	153	231.4559	1.522736			
Total	155					

Summary

This chapter consisted of a discussion of the results of the analysis that was performed on the data. A discussion of the pilot study was presented. Discussed were the companies involved, the number of respondents, the user types and the results of analysis.

This discussion was followed by a presentation of the complete study with all participants. With 155 actual participants used in the study, the response rate was

21.38%. Tables were included that showed the companies that participated and demographic information about respondents and the organizations that they work for.

This was followed by a discussion of the suspected moderator variable, user type. In analysis of the user type, it was determined that the categories of user type had to be combined to provide adequate cell sizes for analysis. This resulted in three user types, which were presented in Table 16. Table 17 provided a look at the independent variables and a discussion was presented to explain the categories used for analysis. Next a discussion of the factor analysis on the user satisfaction dependent variable was presented. Table 18 displayed the questions that loaded on the single factor, user satisfaction with the support function, explaining 55% of the variance.

In the next section, a discussion is presented of the factor analysis on the dependent variable service quality. As with the user satisfaction analysis, we are looking at one factor, quality of the support function. This factor explained 50% of the variance of the responses. Table 19 presented the questions that loaded on this single factor

The next three sections of the chapter discussed an analysis of the 10 research questions and the hypotheses for each. The section on hypotheses I through IV reported the analysis for the service quality dimension with the independent variables. The section on hypotheses V through VIII explained the user satisfaction dimension with the independent variables. The section hypotheses IX and X discussed the independent variable system type with both of the dependent variables.

Several of the hypotheses were not supported. Only one ANOVA yielded a significant interaction term. The independent variable, support technician's level, had an effect on both of the dependent variables, service quality and user satisfaction. The independent variable, location of service personnel, had a significant effect on only the dependent variable user satisfaction. System type had no effect on either dependent variable. In addition, user type was a significant moderating variable for analysis with the dependent variable service quality.

The final section of the chapter presented results of comparisons on the data collection methods, the pilot study, the main study and the web survey. No significance was found between groups for either of the dependent variables.

CHAPTER VI

CONCLUSIONS

Overview

As computer usage increases in organizations and end-user computing continues to expand, the study of information systems becomes increasingly important. The ability of organizations to continue to adapt and thrive in the midst of change is affected by the success of their information systems. Previous research has focused on the development process to determine the success of the support organization. This study also looks at the success of MIS but from the view of the support function. This study attempts to assist IS managers in understanding the changing face of the user population and their support needs by addressing specific questions regarding user satisfaction with support and the quality provided by the MIS support unit.

The implications of the results are addressed in this chapter along with a summary of the research process. Additionally, a discussion of the open-ended questions is presented. Another section addresses the issues of infrastructure and network support as well as advanced support. This is be followed by a discussion on how MIS organizations may benefit from the findings. The chapter concludes with a section on the limitations of the research followed by suggestions for future research.

Summary of the Research Process

An evaluation of prior research was conducted to provide a foundation for the research and develop the research framework. Previous research in six distinct areas provided input to this study of the support function. The literature categories reviewed were: computer user type, information center research, end-user computing, user satisfaction, service quality and other sources of computer support. The prior research led to the development of the total research framework, Figure 2 in chapter 3.

The primary focus of this study was to investigate and identify support structures and requirements necessary to meet the needs and expectation of the changing user population. Therefore, this study looks at some of the more important variables that were expected to influence service quality and user satisfaction. A modification of the research framework is presented in Figure 3, chapter 3. The five independent variables under evaluation on user satisfaction and service quality were: system type, method of support, type of support, the support technician's level, and the location or proximity of the support technician to the user. In addition, the variable user type was evaluated as a moderator.

A survey of organizational MIS support units was conducted. One hundred and fifty-five surveys were returned evaluating various facets of their MIS support function in regard to user satisfaction and service quality. The sample size was deemed appropriate as it was close to what many previous studies have used in survey research regarding UIS and service quality in information systems (see Table 6 chapter).

The validity of the survey instrument was enhanced by the evaluation of the prior studies and by testing the instrument in a pilot study. The feedback from committee members and the expert panel led to the conclusion that the content of the questionnaire reflected important issues relative to MIS support. The reliability of the constructs was verified by calculating Cronbach's alpha. The calculated value for alpha was within the acceptable limits for research studies.

The research questions were evaluated by specific hypotheses. Table 37 presents a summary of the results of hypotheses testing. As shown in Table 37 only four of the specific hypotheses were rejected.

Hypothesis 1, the effect of method of support, was the only hypothesis tested that that had a strong interaction with the moderator variable user type. Therefore, we can conclude that method of support is affected by user type. The support technician's level was significant for both of the dependent variables, user satisfaction and service quality, while location of the support personnel was only significant for the user satisfaction dimension.

The proximity (location) of the support staff did not have any significance on the quality provided by them (hypothesis 2). However when examining the effect on user satisfaction the location of the support staff was found to be significant (hypothesis 6).

Differences due to system type was examined with regard to service quality and user satisfaction. The study revealed no significant differences. This was unexpected as previous literature suggests that system type may affect user satisfaction with the product.

However, when system type was addressed in the previous literature, they were discussing the development process. Hence, in this study, system type whether it is purchased software, developed software, or communication/mainframe software did not seem to have any impact on the users' perception of satisfaction or quality.

Table 37: Summary of results

Hypotheses	Results
H_{o1}: There is no effect on service quality by method of support across user types.	Reject
H_{o2}: There is no effect on service quality by location of support staff across user types.	Fail to Reject
H_{o3}: There is no effect on service quality by type of support across user types.	Fail to Reject
H_{o4}: There is no effect on service quality by support technician's level Across user types	Reject
$H_{o5:}$ There is no effect on user satisfaction by method of support across user types	Fail to Reject
$H_{o6:}$ There is no effect on user satisfaction by location of support staff across user types	Reject
$H_{o7:}$ There is no effect on user satisfaction by type of support across user types	Fail to Reject
H_{o8}: There is no effect on user satisfaction by the support technician's level across user types	Reject
H_{o9}:There is no relationship between system type and user satisfaction	Fail to Reject
$H_{o10:}$ There is no relationship between system type and service quality	Fail to Reject

User type was significant for the service quality dimension but not for the satisfaction dimension. It should be noted that although Rockart and Flannery's (1983) classification of end users is quite popular, this classification was based on end-users in

an early computing period (Govindarajulu, 1996). The advances of technology and the widespread distribution of personal computers has significantly changed users. Incorporated in this study were two additional user types, nonprogrammers – illiterate, and technical support personnel. However, as shown by the respondents, Tables 15 and 16 in chapter 5, users are evolving into more technical users, represented by the higher responses to the technical categories. Hence, a more detailed look at users is necessary to identify the categories and the dimensions represented by each.

Open-ended Responses

Optional questions were included in the research instrument to allow respondents to be specific about the services provided by the support organization. Respondents were asked three open-ended questions. Table 38 presents the first question and the subsequent answers from those respondents that choose to reply.

Users responded either positively, negatively or gave general informative responses when asked 'What is missing for the support function at your organization?' As shown in Table 38, 47 responses to the question were received from the 155 questionnaires completed. Several respondents replied that there were no changes necessary and they were happy with the support they were receiving.

Table 38: What is missing from support at your organization?

#	P/N/I	What other types of information systems support is needed in your organization?
1	Positive	Current support is good
2	Informative	Need how to manuals
3	Positive	No changes needed, when we call it gets fixed.
4	Positive	None, proficient level exists.
5	Negative	Need different program knowledge not super specialist.
6	Informative	More AS/400 Communication knowledge
7	Informative	User training and documentation.
8	Informative	Users need more training.
9	Negative	More windows NT support needed.
10	Positive	We have everything already.
11	Informative	Hands-on.
12	Negative	Answer user questions and system support for our department
13	Negative	Need advanced functionability.
14	Negative	Need to centrally document issues.
15	Negative	Need on-line tracking of problems.
16	Positive	We're fine.
17	Negative	Missing Unix system support.
18	Negative	Need better application support.
19	Informative	Long term planning.
20	Negative	Need more development support.
21	Informative	Self-help options for users
22	Negative	No standards for phone support and help desk.
23	Positive	Good, automated tools for tracking.
24	Negative	Never updated PC's – need better equipment
25	Negative	Need more support for analysis writing queries.
26	Negative	Need better systems and application training.
27	Negative	Need seasoned, bright individuals who are willing to go the extra mile.
28	Negative	Need additional personnel
29	Negative	Need better PC support.
30	Informative	User specific/department specific knowledge
31	Positive	None
32	Negative	Need infrastructure connections that are more consistent
33	Informative	Better documentation of hardware and software being used
34	Negative	Need more support staff
35	Informative	On-line help.
36	Informative	Reference books supplied to employees using software.
37	Informative	Help desk walk through service.
38	Negative	Need phone support.
39	Negative	Need support personnel to understand advanced functions on packages
40	Informative	We cover the globe. Everything, windows, Novell, Notes and SQL databases.
41	Negative	Assistance in conversion of complex files during upgrades.
42	Informative	On-the-job training.
43	Positive	Everything is fine.
44	Negative	Timely support.
44	Informative	Peers are often support vs. help desk support (on use of software)
46	Negative	More personal one to one instruction.
47	Negative	I'd like to see the present system be properly supported.

Of the informational responses, users would like more training and documentation, as well as "how-to" manuals or reference books on the software provided. They suggested that this may cut down on the calls for help. Other respondents gave suggestions about using other forms of support, particularly on-line support for repetitive questions or for self-help and in some cases the ability to use trained peers as a resource instead of the formal support process.

When responding negatively to the question, users asked for better equipment, better on-line tracking or a requirement to centrally document the issues. Better communication between support personnel and more timely support is required. Respondents asked that standards be set for the support organization and that support needed to be more consistent in fixing problems. Additionally, respondents commented on the types of support that are not provided by their particular support organization, specifically, NT support, mainframe support and Unix support.

Tables 39 and 40 refer to the satisfaction of the user. The second opened ended question is presented, 'What would it take to make you a more satisfied user?' with the respondent replies. These two tables contain 78 responses or suggestions to help make the users more satisfied with the support they receive.

Table 39: What would it take to make you a more satisfied user?

#	What would it take to make you a more satisfied user?
1	Better Communication or status or update on outstanding issues.
2	Prompt service.
3	Better hardware.
4	None, proficient level exists.
5	Better turn around time.
6	HP300 Gateway up … not down
7	More timely in getting to calls.
8	Expertly skilled support employees.
9	Better flowing communications for status of jobs.
10	Make sure that when one problem is fixed, the fix does not affect other components, which it often does. Check all software before leaving users desk.
11	Upgrade equipment, software, screen size, etc.
12	Timeliness of technician response (Staffing?)
13	Up to date and reliable equipment.
14	Have someone "on call" to answer quickly and be knowledgeable of programs
15	Shorter wait for help desk calls.
16	Faster response time.
17	Quicker response on initial call for help.
18	Support folks should know more about mainframe apps and operating system.
19	More knowledge on how to's.
20	Knowledge experts.
21	Specific system support for our department.
22	Less phone waiting time listening to happy music.
23	Quicker investigation and more support personnel.
24	Listen to understand problem.
25	On-line support.
26	Applications need to work more consistently.
27	Time management.
28	Expectations of software delivery date met.
29	Follow-up.
30	Defined Standards of equipment, software and the support expectations.
31	Consistent service.
32	More knowledge.
33	Faster response time.
34	Solve problem on time.
35	Accountability on the part of the LAN dept.
36	Better support.

The two major themes that come out of this question are related to time management and to training, experience or knowledge. Twenty-five responses came from the time component. It contained responses referring to a wide range of issues, from the length of time to wait on the telephone for the help desk to the length of time it takes to

finally fix the problem, or even length of time to delivery date.

The second major theme was related to experience and/or knowledge or to the fact that management does not provide enough training to employee on either new technology or on the programs written in house. Nineteen of the 78 responses were related to these issues. One respondent suggested knowledge experts for each of the areas of support. Another stated that 'expertly skilled support employees' are needed, while others state that the employees just need proper training on the programs, software or hardware used in the company or in their particular departments.

In addition to the previously mentioned components, three other minor themes emerged from the respondent data. These are related to staffing (7 responses), updated equipment (9 responses) and communication issues (6 responses). In regard to staffing many respondents suggested that staffing would improve turn-around time. As far as equipment is concerned, users requested upgraded equipment (PC's and software). This many responses on the open-ended questions requesting better or more equipment is surprising as the questions regarding equipment on the user satisfaction section of the questionnaire did not load on the user satisfaction dimension. In addition to equipment for the users, it was suggested that the support personnel may not have all the tools and equipment they need to diagnose the problems.

Table 40: What would it take to make you a more satisfied user? – cont'd.

#	What would it take to make you a more satisfied user?
37	Better product and more timely service.
38	Quicker response time and/or answers from the help desk.
39	Better systems and application training.
40	Hire experienced people who are willing to go the extra mile.
41	New software training.
42	Better PC support and better report options.
43	I'm a satisfied user already.
44	Fix the problem faster, don't experiment on my PC.
45	Keeping the customer informed if the delay in repair is lengthy.
46	Reduced wait time to engage helpdesk consultants.
47	Sometimes support people don't know how to fix something or have the equipment they need.
48	More knowledge.
49	More timely response.
50	It takes too long to get to talk to a live person on the help desk.
51	Better follow-up.
52	More support accessibility.
53	Consistent infrastructure with 100% connectivity.
54	Support personnel that understand the problems and know how to fix them.
55	Support organization that demonstrates consistent ability to solve problems on a timely basis.
56	Up to date equipment.
57	Better equipment.
58	I'm satisfied.
59	More direct communication and discussion.
60	More IS who are thoroughly familiar with software programs used by the company.
61	The department is understaffed.
62	More personnel and more training for them.
63	When answering the phone, don't be arrogant.
64	They need more practice.
65	Even more timely responses to help desk calls.
66	Proper training on programs.
67	Better training and faster response time.
68	Newer equipment.
69	Faster response time.
70	Better at support and Microsoft products.
71	In house software that provides correct results, not just an answer.
72	More user friendly.
73	Don't use the hold button.
74	They don't have enough expertise.
75	Fix my computer right the first time.
76	Faster response by more knowledgeable and dedicated staff.
77	More personnel and one to one instruction.
78	Updated hardware and software past 1992.

In reference to communication issues, respondents wanted to be kept informed

about the status of their problem. In addition users requested that support staff listen to their problem and not make assumptions. Furthermore, they requested more direct communication and discussion about the problem and follow-up after the problem is fixed. Respondents identified many other issues; however, they don't fit into any of the previously defined categories. Some of the more interesting responses addressed accountability, system availability, standards to be followed by support personnel, and reliability of the staff, the equipment and the software (i.e., software that provides the correct answer not just an answer). On response of particular interest was 'make sure that when one problem is fixed, the fix does not affect other components.' That is, fix the problem right the first time and don't cause the next problem.

Tables 40 and 41 present results for the final question. This question asks respondents what is needed to improve the quality of the support organization.

Not surprisingly, the major themes that emerged from this question were similar to the question addressing satisfaction. However, many more responses were received on the quality question for a total of 94 responses from the 155 respondents. For the quality question, three major themes are identified, knowledge, experience and training, staffing and time management, while two minor themes emerged, communication and management issues.

Table 41: What is needed to improve quality in your support organization?

#	What is needed to improve the quality of your support organization?
1	Better training for support team.
2	Prompt service.
3	Current quality is good.

4	Better informed support group.
5	It's very good the only improvement would be dedicated to our needs which is impossible.
6	Fix the problem the first time.
7	Expertly skilled support employees.
8	None, we call, they come down and do a great job and fix it.
9	Better communications.
10	More thoroughness.
11	Better communications between LAN and support.
12	Faster response time.
13	Better training and more hours of operation.
14	Training.
15	Know about our equipment and software.
16	Able to help ASAP.
17	Better trained staff.
18	New management.
19	Better trained support personnel.
20	1 or 2 more people at the help desk.
21	More personnel.
22	More employees.
23	More training.
24	Shorten the amount of time you have to listen to recorded music before you get a real person.
25	More money and more time.
26	Experienced consultants.
27	Specific system support for our department.
28	Ticket tracking application.
29	More responses in the support organization.
30	Better communication between support personnel.
31	Business practices and procedures better defined.
32	Better training.
33	Clearly defined consistent process.
34	Additional staff.
35	We're fine.
36	We have great support.
37	Change management.
38	More training for the helpdesk support personnel.
39	More dedication and knowledge.
40	Communications.
41	Less surveys/more training.
42	More bodies and more training.
43	Better management – run shop like a profit center.
44	Better attitude.
45	Training, less turn over.
46	More people and resources to improve response time.
47	Experienced employees.
48	Accountability

Knowledge, experience and training had, by far, the most responses for improving quality; 30 responses addressed this subject. This is not unusual, as knowledge of a

product always increases the quality of the service for the product. The product here is computer support and therefore the more training and the more knowledge that the support staff has, the better the support they provide to the users. One user suggests "get people with more experience in support, and pay them for their experience, then the turnover will not be as high." This response addressed not only the knowledge theme but also the staffing problem. Staffing was as second theme to emerge for the respondent data, 17 of the responses were related to this topic. Many respondents believe that the more people providing support the better the support will be, this may not be the case if the experience level is adequate.

The communications issue was the next theme to emerge from the responses provided by the users. Not only do users want better communication between themselves and the support staff, they want better communication between the support staff members. Some of the respondents mentioned that the support sub-units within the support function do not communicate. This would lead to duplication of effort and extending the time before the problem is resolved.

Table 42: What is needed to improve quality in your support organization? - cont'd.

#	What is needed to improve the quality of your support organization?
49	They need to get their job finished to satisfactory and on time.
50	More staff and training.
51	Effective communication.
52	Better systems and application training.

53	Quicker response time.
54	Dedication, ability to multi-task, experience.
55	Quicker response times and set appointments for service.
56	Better responsiveness.
57	We have a great support group.
58	Increase knowledge of support staff.
59	Need processes.
60	Training, easy access to higher levels of support.
61	Friendlier and less intimidating help desk personnel.
62	Need to be quicker in creating trouble tickets.
63	Must reduce time before escalation to the next level.
64	Must fix the problems, not tell users that the problem cannot be fixed.
65	Training.
66	Better turnaround time.
67	Changes need to start at the top.
68	Need more support personnel.
69	More trained staff.
70	More qualified people – better training.
71	Training the support organization.
72	More support personnel.
73	Determine the real problem, not the fastest band aid or work around. Not all holes are round and not all pegs are square.
74	Train the support personnel.
75	Increase the skills on Windows95 + platform and how the apps work with it.
76	More help with more staff.
77	Friendly, on-time service.
78	Faster service.
79	More training.
80	Get people who have more experience in support and pay them so the turnover isn't so high.
81	More personnel and more training.
82	Hire truly qualified people.
83	Provide job training and advanced training with the programs.
84	Better attitude in IS
85	More personnel, newer equipment
86	Better time management.
87	Someone with formal training better design for in-house developed software.
88	More Information Technology support time.
89	Very happy.
90	More people.
91	Leadership that is around and not always at meetings.
92	Larger support staff with an inclination to teach and not just fix the problem.
93	More clear communication of the available services.
94	Common sense and more funding.

The third major theme to be identified by the data addresses time management. Seventeen of the respondents mentioned the time factor as relating to the quality of service. Responses like "help ASAP" and "better turn-around time" are included in this category.

The final minor theme addressed is management. Several respondents do not blame the support personnel for lack of quality but blame management. Responses range from better and/or new management to adding change management. One respondent mentioned "starting at the top" as only way to improve the quality in the support organization, while another addressed proper funding of the department.

Some of the other comments provided by the respondents address better attitude, clearly defined processes, better business practices, dedication of the employees and hiring staff with an inclination to teach. One respondent mentions using common sense in solving problems, while another mentions multi-tasking as a requirement. When addressing fixing the problem one respondent stated "must fix the problems, not tell the users that the problem cannot be fixed." Another stated "determine the real problem, not the fastest band aid or work around." These last responses truly address the issue of service quality.

It is important to mention that not all the responses were negative. Seven of the respondents were very pleased with the quality of the support they receive, stating "current quality is good," "we call, they come down and do a great job and fix it," and "very happy" or "we're fine" and "we have a great support group." These respondents let us know that not all support organizations need to change. Some are out there providing the needed support to users.

Infrastructure, Network and Advanced Technical Support

One of the aspects of this study is the interest in infrastructure and network

support and how the users perceive this function. The independent variable type of support contained questions to measure satisfaction and service quality in regard to infrastructure and network support. The hypotheses that address this independent variable are IX and X. However neither hypotheses was found to be significant. In addition only two of the open-ended responses addressed infrastructure and network support. Therefore, we conclude that users do not separate the support of the network or the infrastructure as a separate component of support.

In addition, advance technical support was of interest to the researcher. The independent variable that measured this component was the support technician's level. The hypotheses that measured this component are IV and VIII. Both of these hypotheses were found to be significant. Hence, we conclude that advanced technical support as measured by the support technician's level has an affect on user satisfaction and service quality. It should be noted that many of the responses from the open-ended questions addressed this same issue. Knowledge, experience and training were a major theme in all three open-ended questions. Users specify that they want access to expert and knowledgeable support personnel. These individuals provide advanced technical support, improve user satisfaction and add to quality and value to the support organization.

Implications of the Research

Management is ever challenged in this information age to provide the best service to the customer, whether they are internal or external customers. A significant change in the user population has occurred due to the increase of technology. Hence, users are now

more technically inclined and therefore, their needs have changed.

The aim for this research was to improve the understanding of the support function within MIS. The results are very pertinent to managers of MIS department as it clarifies the support needs of the users and identifies issues of user satisfaction and service quality. This information is valuable for managers who wish to create a support organization within MIS, redesign the present support function, or who are even looking to outsource the support function. The results of this study can be used to assist managers in providing a viable support organization.

The results of this study also impact IS researchers as contributions are made which increase the understanding of the independent variables and how they affect the dependent variables, user satisfaction and service quality. Previous research addressed some of the constructs of this research but did not combine them into a complete research framework. A further benefit to IS research involves the ability to take two streams of research together. The findings of this study can be used to merge models of user satisfaction and service quality, even though this is not the first attempt to merge the two (see Kettinger and Lee, 1994).

Limitations

Survey research has some limitations that cannot be overcome. First, unless the researcher is with the respondent, it is not possible to know if the right person is answering the questions. Secondly, operational definitions of constructs do not always

mean the same to all respondents. The wording of the questions may introduce biases. Additionally, limitations of self-reported surveys, including possible falsification of answers by respondents, apply to this research.

External Validity

Kidder and Judd (1986) define external validity as "the generalizability of a research finding, for example, to other populations, settings, treatment arrangements, and measurement arrangements." Attempts were made to randomly select organizations that met certain requirement, that is, they either had an internal support organization or they contracted support. Additionally, they should be a representative sample from many different geographical areas and a cross section of different industry types.

These goals were met in part. Individuals who participated in the study were from the population of interest. However, the individuals were from only twelve organizations, excluding the web based responses. The organizations contacted did have internal support organizations or contracted support as required. Additionally, they represented a cross section of industries, although the banking industry and government or public sector organizations were not represented in the sample. However, the organizations that responded to the request for participation were located in two geographical areas, the southwest and the mid-west, with the majority of the organizations having their headquarters in either Dallas/Ft. Worth or Chicago.

Measurement Instrument Validity

Many of the measurement instrument threats have previously been discussed in chapter 4. Two additional problems could threaten the validity of the measurement instrument: the length of the questionnaire and problems involving individual questions. Several of the questionnaires returned were rejected for use because of missing information. The section on service quality was not filled out or filled out improperly on many of the surveys. This could be attributed to respondent fatigue. To eliminate this threat, future administration of the instrument should be performed in two sessions: one for user satisfaction and the other for service quality.

The final threat to instrumentation validity has to do with the individual questions. Although the mean of the questions loaded on the specific factors, user satisfaction and service quality, analysis of each individual question was not done. In some cases, prior studies have investigated these questions (e.g., the extensive study of the SERVQUAL instrument). Any questions added to this study by the researcher have not been put to the same scrutiny. Additionally, removing some of the questions previously studied (e.g., those questions not related to support from the Doll-Torkzadeh UIS instrument) may affect the application of the questionnaire. If the Cronbach's alpha for the constructs had not been sufficiently high, then further analysis of the questions and the constructs would have been necessary. It would not be surprising to find that certain individual questions may not contribute to the measurement of the constructs of interest. If further study of a

subset of these variables is warranted, a more extensive analysis of the individual questions would be beneficial.

Statistical Validity

Statistical threats were addressed and considered throughout the examinations of responses. Factor analysis was performed to obtain the single dimensional constructs for quality and satisfaction. As is typical in survey research, constructs were examined for reliability using the popular Cronbach's alpha. The scree plot was used to confirm the retention of only one factor for each dependent variable. This was expected as the study was performed with the intent to use single dimensional factors.

For each hypothesis, an ANOVA procedure was first performed and then if significance was reported, a Tukey's multiple comparison procedure was performed to identify and verify of the differences in the mean levels. Usual experimental conditions were implemented to control for any biases or external factors affecting the responses.

Future Research

During the course of this research study a number of issues have come to the surface that would lead to future research opportunities. First, as mentioned previously, users are becoming more technically inclined. Therefore, it may be time to reevaluate the categories of user type, taking into consideration the advances in technology. Secondly, many other independent variables were identified in the total research framework. Since many of the independent variables analyzed were found not to be significant on service

quality and user satisfaction, these additional variables should be evaluated to determine their impact on the dependent variables.

Many studies have looked at critical success factors of information centers, but no study has looked at them for support organizations within the MIS organizations. Additionally, the impact of the Internet on the support function has not been addressed in prior research. This is an area that is having a major impact on support organizations. Finally, advanced tools are now being used in support organizations. These tools, e.g., remotely possible, allow the support person to remotely support the users by allowing them to "take over" the desktop. Implementing these tools may significantly impact user satisfaction and service quality and could be a significant research undertaking.

APPENDICES

APPENDIX A

LETTER OF INTRODUCTION

May 1, 1999

{name}
{address}
{organization}

Dear {name},

The University of North Texas in cooperation with Sabre International is conducting a research study into the critical area of MIS user support organizations. I would like to solicit your assistance and at the same time offer my assistance. In addition to being a Doctoral Candidate at the University of North Texas, I am also a Sr. Communications Engineer at Sabre International.

My doctoral dissertation examines one of the top concerns that most MIS organizations face today: How do we evolve into a viable support organization in face of rapidly changing technology and increasing demands from end users. The information provided by this research will aid in this endeavor.

The enclosed packet of 20 surveys should take only a few minutes to administer. Please designate one of your staff members to pass these out and collect them back from users of support and employees of MIS. All employees are eligible to fill out the questionnaires, as even MIS employees are users of support. If you users would rather complete the questionnaire electronically, they can do so by accessing the following site: http:\\ots.sabre.com\support\issues.htm.

While the individual responses are confidential, if you would like a copy of my final report I will be happy to provide it to you. All you need to do to receive one is to respond to this request and ask for the results. This information should help you in evaluating your support organization and making any changes in the future.

Please return the completed questionnaires in the envelope provided in the packet. My business card is attached to each of the surveys if your users would rather respond individually.

Thank you for your assistance in this research effort. We are confident that the findings will be beneficial to you and to other MIS professionals and managers. If you have any questions or concerns please feel free to contact me at the e-mail address below.

Sincerely,

Charletta F. Gutierrez
Sr. Communications Engineer
The Sabre Group

e-mail: **Charletta.Gutierrez@sabre.com** or
gutierre@unt.edu

APPENDIX B

QUESTIONNAIRE

Questionnaire

1. Please check the type of business or industry that best describes where you work?

___ Retail ___ Government ___ Agriculture
___ Wholesaler ___ Insurance ___ Utilities/Mining
___ Financial ___ Transportation ___ Manufacturing
___ Technology ___ Communications ___ Hospitality/Service
___ Medical ___ Legal ___ Education
___ Other _____

2. How large is the company you work for?
___ less than 15 employees ___ 16-500 employees
___ 501-5000 ___ over 5000

3. Mark which best describes your company?
___ single site ___ multiple domestic sites
___ international ___ multiple international sites

4. Which best describes the computer support organization in your company?
5.
___ none or unknown ___ use local expert
___ use external vender ___ consultants
___ help desk ___ on-line help
___ local MIS ___ centralized MIS
___ information center

5. Is the computer support you receive?

___ by application (payroll, e-mail, graphics)
___ by functional area (Finance, Marketing, Personnel)
___ by operating system (mainframe, network, Windows)
___ by other_____

6. Please rank the first five by importance, with 1 being most important and so on, all the services that your support organization provides to users. If the service is not provided leave blank. If the service is not in the top five rankings mark with a 6.

___ hardware support ___ software support
___ infrastructure (network) ___ platform (DOS, Win95, UNIX, etc.
___ training ___ software development
___ consulting ___ acquisition/deployment of equipment
___ software integration ___ external connectivity (Internet)
___ virus protection ___ security access
___ troubleshooting ___ advanced technical support
___ how to questions ___ e-mail
___system failures ___ backups
___ other _____

7. What was the type of support you received on your last support call?

___ hardware support ___ software support
___ infrastructure (network) ___ platform (DOS, Win95, UNIX)
___ training ___ software development
___ consulting ___ acquisition/deployment of equipment
___ software integration ___ external connectivity (Internet)
___ virus protection ___ security access
___ troubleshooting ___ advanced technical support
___ how to questions ___ e-mail
___system failures ___ backups
___ other _____

8. What is the proximity of the support staff to your location?
___ local support ___ same building
___ same city ___ non-local support
___ none (unknown)

9. Please rank the first five by importance to you , with 1 being most important, all the systems that you use to do your work. Leave blank if you do not use the type of system. Mark with a 6 if used but not ranked in the top five.

___ purchased software (shrink-wrapped)
___ purchased software (developed)
___ client/server based applications
___ LAN based applications
___ in-house developed applications
___ communications software (telnet, FTP, Gopher, etc.)
___ e-mail, Lotus Notes
___ mainframe (IMS, TSO, DB2,etc.)
___ internet/intranet services

10. What type of system did you last call the computer support organization for?

___ purchased software (shrink-wrapped)
___ purchased software (developed)
___ client/server based applications
___ LAN based applications
___ in-house developed applications
___ communications software (telnet, FTP, Gopher, etc.)
___ e-mail, Lotus Notes
___ mainframe (IMS, TSO, DB2,etc.)
___ internet/intranet services

11. How many levels of support are you aware of in your organization?
___ none (unknown)
___ 1 (phone support - entry level)
___ 2 (multiple application - some experience)
___ 3 (advanced technical support)
___ 4 + (engineers)

12. On your last support call, from what level of support was the technician assigned to your problem?
___ none (unknown)
___ 1 (phone support - entry level)
___ 2 (multiple application - some experience)
___ 3 (advanced technical support)
___ 4 + (engineering)

Satisfaction measures (of computer support personnel) in general:

Please circle the number in each line that appropriately identifies your feelings toward support, not towards the systems that you use.

13. In general the support personnel:

are sensitive to your needs	1 2 3 4 5 6 7	are insensitive to your needs
do not explain things well	1 2 3 4 5 6 7	explains things well
are excellent listeners	1 2 3 4 5 6 7	do not listen well
understands my problem	1 2 3 4 5 6 7	does not understand
knows nothing about my job	1 2 3 4 5 6 7	understands my job
are easy to talk to	1 2 3 4 5 6 7	are difficult to communicate
are easy to contact	1 2 3 4 5 6 7	are hard to contact
are unreliable	1 2 3 4 5 6 7	are very reliable
are not very effective	1 2 3 4 5 6 7	are very effective
are very efficient	1 2 3 4 5 6 7	are not very efficient
is well trained	1 2 3 4 5 6 7	needs more training

14. When asking questions of the support staff: **Do you Feel**

Hesitant	1 2 3 4 5 6 7	I feel comfortable
Foolish	1 2 3 4 5 6 7	I feel foolish
Intimidated	1 2 3 4 5 6 7	I am never intimidated
Important	1 2 3 4 5 6 7	Insignificant
Good, knowing they will help	1 2 3 4 5 6 7	Fustrated
Like I'm wasting their time	1 2 3 4 5 6 7	Like they care about my problem

15. In general the support staff knows the answer to:

few computer questions	1 2 3 4 5 6 7	most computer questions
knows about applications	1 2 3 4 5 6 7	know very little
specific system questions	1 2 3 4 5 6 7	more general questions
only technical questions	1 2 3 4 5 6 7	variety of computer questions

16. The general attitude of the support staff is:

self-centered	1 2 3 4 5 6 7	user-oriented
uncooperative	1 2 3 4 5 6 7	cooperative
is courteous	1 2 3 4 5 6 7	is not courteous
negative	1 2 3 4 5 6 7	positive
sympathetic	1 2 3 4 5 6 7	offers no sympathy
friendly	1 2 3 4 5 6 7	hostile
arrogant	1 2 3 4 5 6 7	humble
consistent	1 2 3 4 5 6 7	inconsistent

17. How likely are you to contact the support staff again?

definitely will	1 2 3 4 5 6 7	will avoid at all costs

18. The technical competence of the support staff is:

obsolete	1 2 3 4 5 6 7	up-to-date
sufficient	1 2 3 4 5 6 7	insufficient
inferior	1 2 3 4 5 6 7	superior
never meets my needs	1 2 3 4 5 6 7	always meets my needs
confident	1 2 3 4 5 6 7	scatterbrained

19. The response time of the support staff is:

always adequate	1 2 3 4 5 6 7	unacceptable
slow	1 2 3 4 5 6 7	fast
consistent	1 2 3 4 5 6 7	inconsistent
reasonable	1 2 3 4 5 6 7	unreasonable
greatly affects my performance	1 2 3 4 5 6 7	has minimal effect on my work

20. In general how satisfied are you with:

the support staff	very satisfied	1 2 3 4 5 6 7	not at all satisfied
with you last service	very satisfied	1 2 3 4 5 6 7	not at all satisfied
with your technician	very satisfied	1 2 3 4 5 6 7	not at all satisfied
the quality the service	very satisfied	1 2 3 4 5 6 7	not at all satisfied
the computer systems	very satisfied	1 2 3 4 5 6 7	not at all satisfied

21. Do you have the option to use non-IS support personnel?

___ yes ___ no

22. If non-IS support is available, which have you used?

___ non-IS computer support ___ on-line help
___ consultants ___ a local expert
___ vender support ___ software support line
___ other _____

23. Which of the following systems have you used?

___ personnel computers ___ midrange ___ mainframes

24. Do you feel comfortable working with computers?

___ yes ___ no

25. Which of the following **best** describes your computer ability?

___ non-programmer (computer-illiterate)
___ non-programmer (computer-literate)
___ command level user
___ end-user programmer
___ functional support personnel
___ end-user computer support personnel
___ technical support personnel
___ data processing programmer

26. How long have you been using computers regularly?

___ less than 1 year ___ 1-3 years
___ 4-6 years ___ 7+ years

27. On the following computer components, how would you rank you abilities?

computer software	excellent	1 2 3 4 5 6 7	not proficient
computer hardware	excellent	1 2 3 4 5 6 7	not proficient
computer operating systems	excellent	1 2 3 4 5 6 7	not proficient
communications software	excellent	1 2 3 4 5 6 7	not proficient
overall computer ability	excellent	1 2 3 4 5 6 7	not proficient

28. Are you?

___ male ___ female

29. Please use % = 100 to approximate the amount of time you spend on each activity during your work week.

___ work not related to the computer
___ using general use software (i.e., word processing, e-mail, etc.)
___ using software specific to your particular job
___ other computer related activities

30. How often do you call for computer support?
___ never ___ 1-2 day ___ 1-2 week
___ 1-2 month ___ 1-2 a year

31. How old are you?
___ less than 21 ___ 21-25 ___ 26-30 ___ 30-35
___ 36-42 ___ 43-50 ___ 50-60 ___ over 60

32. What type of job do you have?

___ clerical/operational ____ professional
___ managerial/supervisory ___ administrative
____ technical ___ computer professional
___ other _____

33. How long have you been working? (in years)

_____ for your company
_____ in your department
_____ in the same type of job
_____ total years experience

34. What is the highest level of education you have? (Please select best answer)

____ did not complete highschool ____ high school graduate
____ some college coursework ____ 2 year degree (including technical)
____ 4 year degree ____ some graduate work
____ Master degree ____ Ph.D.

35. Was your major in? Please select only one.

____ Business ____ Liberal Arts ____ Science
____ Engineering ____ Education ____ Other

36. Specify Major field of study for highest degree:
_____

37. Does your computer support organization meet all your needs?

___ yes ___ no

38. Please rate your company's computer support with the last company you worked for?

___ significantly better ___ better ___ same
___ slightly inferior ___ inferior
___ N/A never used computer support elsewhere

Please answer the following questions by ranking the answers with a 4, 3, 2 or 1. With 4 being most like you and 1 being the least like you.

39. When I learn:
___ I like to deal with my feelings
___ I like to watch and listen
___ I like to think about ideas
___ I like to be doing things

40. I learn best when:
___ I trust my hunches and feelings
___ I listen and watch carefully
___ I rely on logical thinking
___ I work hard to get things done

41. When I am learning:
___ I have strong feelings and reactions
___ I am quiet and reserved
___ I tend to reason things out
___ I am responsible about things

42. I learn by:
___ feeling
___ watching
___ thinking
___ doing

43. When I learn:
___ I am open to new experiences
___ I look at all sides of issues
___ I like to analyze things, break them down into their parts
___ I like to try things out

44. When I am learning:
___ I am an intuitive person
___ I am an observing person
___ I am a logical person
___ I am an active person

45. I learn best from:
___ personal relationships
___ observation
___ rational theories
___ a chance to try out and practice

46. When I learn:
___ I feel personally involved in things
___ I take my time before acting
___ I like ideas and theories
___ I like to see results from my work

47. I learn best when:
___ I rely on my feelings
___ I rely on my observations
___ I rely on my ideas
___ I can try things out for myself

48. When I am learning:
___ I am an accepting person
___ I am a reserved person
___ I am a rational person
___ I am a responsible person

49. When I learn:
___ I get involved
___ I like to observe
___ I evaluate things
___ I like to be active

50. I learn best when:
___ I am receptive and open-minded
___ I am careful
___ I analyze ideas
___ I am practical

Quality Measures of Support

Please circle the number in each line that best describes the Quality of your Support Organization.

51. The quality of the support provided by your Computer Support Organization is determined by:

	Strongly Disagree				Strongly Agree
tangible elements(i.e., hardware replaced)	1	2	3	4	5
how soon the problem is solved	1	2	3	4	5
by the interaction between me and the support staff	1	2	3	4	5

Quality is defined in the following five ways:

1. reaching for the highest possible standard
2. giving me more of the ingredients, features or attributes I desire
3. meeting my needs or preferences
4. meeting standards
5. giving value-performance at an acceptable price

52. Which of the above definitions comes closest to how you define quality of a service organization? _____ (write the number here).

53. Which of the above definitions best describes your organization's computer support department? _____(write the number here).

Expectations can be interpreted in the following three statements:

1. What you think is most likely to happen.
2. What you would like to see in an ideal world.
3. The minimum level that is satisfactory to you.

54. When you think of your expectation with your support organization, which interpretation of expectations is most closely aligned with the way you think of your expectations? _____(write the number here).

55. For each item, please indicate:
    a) your expectation of the performance for the item as delivered by an excellent IS support organization,
    b) the performance of your company's support organization and
    c) how important the item is to the quality of the support organizations services.

	Your Expectations of Excellent IS support	Your Support Organizations Performance	How Important to IS Quality
	1=very low		**7=very high**
Up to date equipment	1 2 3 4 5 6 7	1 2 3 4 5 6 7	1 2 3 4 5 6 7
Employees appearance	1 2 3 4 5 6 7	1 2 3 4 5 6 7	1 2 3 4 5 6 7
When a promise is made to do something by a certain time that promise is kept	1 2 3 4 5 6 7	1 2 3 4 5 6 7	1 2 3 4 5 6 7
Employees will be consistently courteous with users	1 2 3 4 5 6 7	1 2 3 4 5 6 7	1 2 3 4 5 6 7
The behavior of IS employees will instill confidence in users	1 2 3 4 5 6 7	1 2 3 4 5 6 7	1 2 3 4 5 6 7
Employees give prompt attention to users	1 2 3 4 5 6 7	1 2 3 4 5 6 7	1 2 3 4 5 6 7
Employees give users individual attention	1 2 3 4 5 6 7	1 2 3 4 5 6 7	1 2 3 4 5 6 7
Operating hours are convenient for all users	1 2 3 4 5 6 7	1 2 3 4 5 6 7	1 2 3 4 5 6 7
Employees understand the specific needs of users	1 2 3 4 5 6 7	1 2 3 4 5 6 7	1 2 3 4 5 6 7
Employees are always willing to help users	1 2 3 4 5 6 7	1 2 3 4 5 6 7	1 2 3 4 5 6 7
Employees have the skills to solve the users problems	1 2 3 4 5 6 7	1 2 3 4 5 6 7	1 2 3 4 5 6 7
Employees are reliable	1 2 3 4 5 6 7	1 2 3 4 5 6 7	1 2 3 4 5 6 7
Employees have the best interests of the users at heart	1 2 3 4 5 6 7	1 2 3 4 5 6 7	1 2 3 4 5 6 7
When a user has a problem a sincere interest is shown in solving it	1 2 3 4 5 6 7	1 2 3 4 5 6 7	1 2 3 4 5 6 7
Employees have the knowledge to answer the users questions	1 2 3 4 5 6 7	1 2 3 4 5 6 7	1 2 3 4 5 6 7

56. What other types of Information systems support is needed in your organization?

_____
_____

57. What would it take to make you a more satisfied user?

_____
_____

58. What is needed to improve the quality of your support organization?

_____
_____

Optional

59. Name:
_____

60. Organizations name:
_____

61. Office phone: (___) _____

62. E-mail Address: _____

63. City:
_____

Thank You.

APPENDIX C

EXPERT PANEL

Name/Title	Company	Years Experience
Mark Demas Information Systems Director	Sterling Communications	25
Dr. John Windsor Chair, BCIS	University of North Texas	22
Milo Brown MIS Support Lead	Formerly of Sabre Incorporated	18
Bill Bozeman E-mail Support Lead	Microsoft	16
Mike Thieme Desktop Support	Sabre Incorporated	12

APPENDIX D

DETAILS OF FACTOR ANALYSIS

QUALITY FACTOR ANALYSIS

The SAS System Sunday, September 26, 1999 28

The FACTOR Procedure
Initial Factor Method: Principal Components

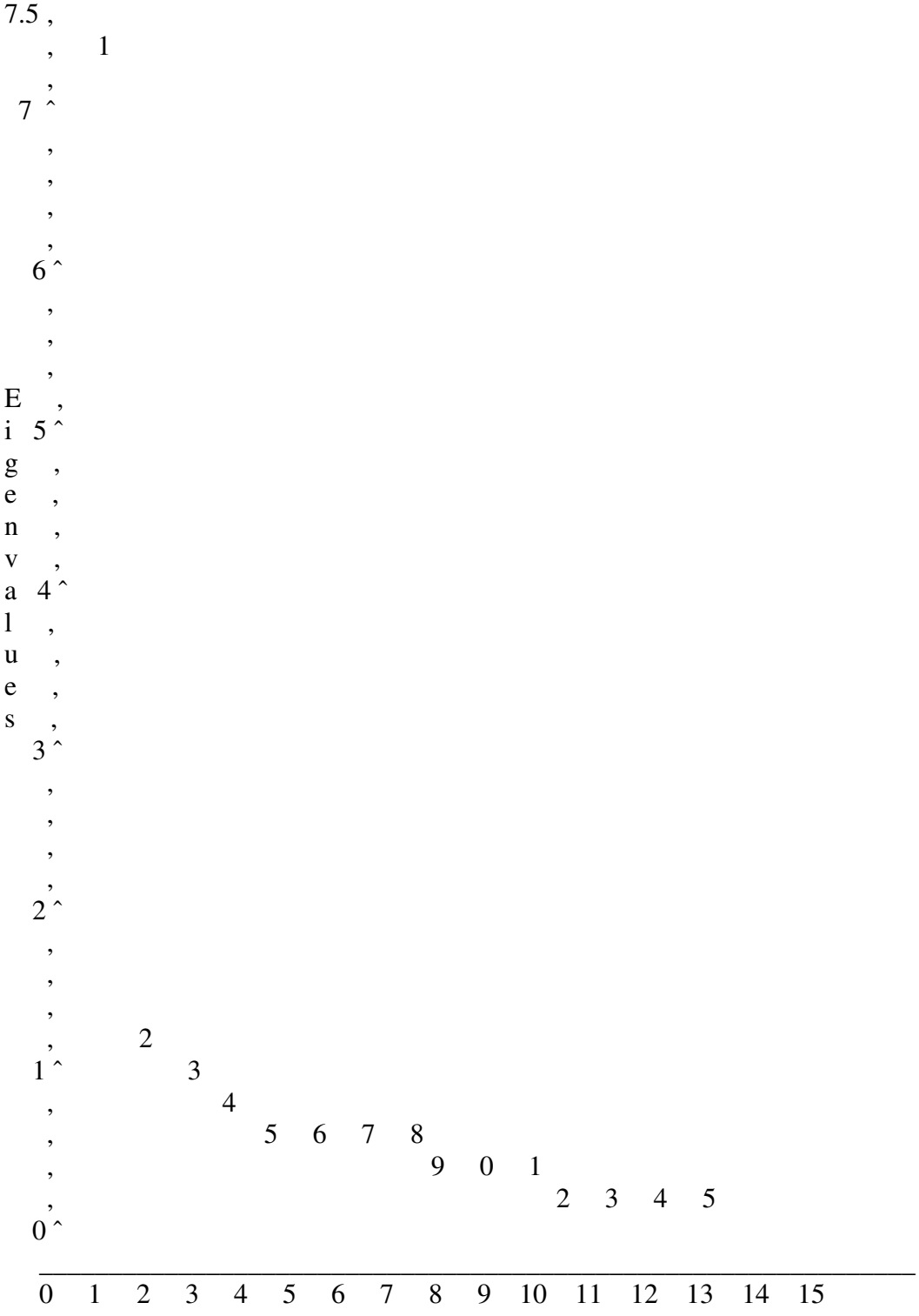
Prior Communality Estimates: ONE

Eigenvalues of the Correlation Matrix: Total = 15 Average = 1

	Eigenvalue	Difference	Proportion	Cumulative
1	7.49472953	6.24683499	0.4996	0.4996
2	1.24789454	0.33993861	0.0832	0.5828
3	0.90795592	0.10516344	0.0605	0.6434
4	0.80279248	0.12975672	0.0535	0.6969
5	0.67303576	0.04817843	0.0449	0.7418
6	0.62485733	0.05258762	0.0417	0.7834
7	0.57226971	0.03451968	0.0382	0.8216
8	0.53775003	0.09974493	0.0359	0.8574
9	0.43800510	0.04046021	0.0292	0.8866
10	0.39754490	0.02777976	0.0265	0.9131
11	0.36976514	0.08280077	0.0247	0.9378
12	0.28696437	0.03689023	0.0191	0.9569
13	0.25007414	0.04922453	0.0167	0.9736
14	0.20084961	0.00533816	0.0134	0.9870
15	0.19551146		0.0130	1.0000

3 factors will be retained by the NFACTOR criterion.

Scree Plot of Eigenvalues – QUALITY DIMENSION



The FACTOR Procedure Initial Factor Method: Principal Components

Factor Pattern

	Factor1	Factor2	Factor3
ques64	0.83538	0.15633	-0.03671
ques66	0.80785	-0.11285	0.20959
ques67	0.80367	0.06471	0.03081
ques68	0.80235	0.20675	-0.00200
ques69	0.77926	-0.25495	-0.04675
ques59	0.77468	-0.07377	0.17559
ques60	0.76488	0.09879	-0.01450
ques63	0.75146	0.00547	-0.30096
ques57	0.72190	-0.15305	0.30010
ques65	0.69368	-0.42455	-0.26071
ques61	0.68219	0.28427	-0.09812
ques58	0.66388	-0.09469	0.13835
ques55	0.53328	-0.17978	0.33584
ques56	0.15863	0.81687	0.30108
ques62	0.52865	0.30086	-0.58965

Variance Explained by Each Factor

Factor1	Factor2	Factor3
7.4947295	1.2478945	0.9079559

Final Communality Estimates: Total = 9.650580

ques55	ques56	ques57	ques58	ques59	ques60
0.42950100	0.78308567	0.63462532	0.46884488	0.63640261	0.59501222
ques61	ques62	ques63	ques64	ques65	ques66
0.55582039	0.71767680	0.65530053	0.72364743	0.72941072	0.70928407
ques67	ques68	ques69			
0.65102217	0.68651552	0.67443066			

Rotation Method: Varimax

Orthogonal Transformation Matrix

	1	2	3
1	0.79357	0.60825	0.01672
2	-0.27456	0.33342	0.90192
3	0.54301	-0.72033	0.43159

Rotated Factor Pattern

	Factor1	Factor2	Factor3
ques66	0.78588	0.30277	0.00218
ques57	0.77786	0.17189	0.00356
ques59	0.73036	0.32012	0.02220
ques69	0.66301	0.42265	-0.23709
ques55	0.65492	0.02251	-0.00829
ques67	0.63673	0.48821	0.08509
ques58	0.62796	0.27257	-0.01460
ques64	0.60008	0.58668	0.13913
ques68	0.57887	0.55840	0.19903
ques60	0.57199	0.50862	0.09563
ques65	0.52548	0.46818	-0.48383
ques62	0.01673	0.84660	0.02570
ques63	0.43141	0.67569	-0.11239
ques61	0.41004	0.58040	0.22545
ques56	0.06510	0.15197	0.86934

Variance Explained by Each Factor

Factor1	Factor2	Factor3
5.0816446	3.3826142	1.1863212

Final Communality Estimates: Total = 9.650580

ques55	ques56	ques57	ques58	ques59	ques60
0.42950100	0.78308567	0.63462532	0.46884488	0.63640261	0.59501222

ques61	ques62	ques63	ques64	ques65	ques66
0.55582039	0.71767680	0.65530053	0.72364743	0.72941072	0.70928407

ques67	ques68	ques69
0.65102217	0.68651552	0.67443066

Cronbach Coefficient Alpha

Variables	Alpha
Raw	0.922580
Standardized	0.923394

Cronbach Coefficient Alpha with Deleted Variable

	Raw Variables		Standardized Variables	
Deleted Variable	Correlation with Total	Alpha	Correlation with Total	Alpha
ques55	0.485936	0.925299	0.487589	0.925811
ques57	0.682242	0.915875	0.682608	0.916826
ques58	0.609286	0.919130	0.609454	0.920244
ques59	0.746114	0.913220	0.746216	0.913806
ques60	0.693869	0.915320	0.694456	0.916267
ques64	0.765241	0.911847	0.766661	0.912826
ques65	0.629251	0.918941	0.628063	0.919380
ques66	0.780623	0.911124	0.781460	0.912114
ques67	0.754440	0.912351	0.755332	0.913370
ques68	0.734663	0.913363	0.735429	0.914321
ques69	0.740339	0.913030	0.736671	0.914262

USER SATISFACTION FACTOR ANALYSIS

The SAS System 14:59 Sunday, September 26, 1999 Factor Analysis

The FACTOR Procedure

Initial Factor Method: Principal Components

Prior Communality Estimates: ONE

Eigenvalues of the Correlation Matrix: Total = 45 Average = 1

	Eigenvalue	Difference	Proportion	Cumulative
1	25.0217202	22.9189862	0.5560	0.5560
2	2.1027340	0.2658717	0.0467	0.6028
3	1.8368623	0.4543489	0.0408	0.6436
4	1.3825135	0.1949062	0.0307	0.6743
5	1.1876073	0.0828427	0.0264	0.7007
6	1.1047645	0.1536662	0.0246	0.7252
7	0.9510984	0.0251280	0.0211	0.7464
8	0.9259704	0.0668451	0.0206	0.7670
9	0.8591252	0.0965410	0.0191	0.7861
10	0.7625843	0.0553483	0.0169	0.8030
11	0.7072360	0.0951060	0.0157	0.8187
12	0.6121299	0.0312685	0.0136	0.8323
13	0.5808614	0.0211607	0.0129	0.8452
14	0.5597007	0.0492623	0.0124	0.8577
15	0.5104384	0.0362991	0.0113	0.8690
16	0.4741394	0.0391415	0.0105	0.8795
17	0.4349978	0.0356580	0.0097	0.8892
18	0.3993398	0.0200580	0.0089	0.8981
19	0.3792818	0.0250797	0.0084	0.9065
20	0.3542022	0.0162427	0.0079	0.9144
21	0.3379595	0.0440366	0.0075	0.9219
22	0.2939229	0.0278091	0.0065	0.9284
23	0.2661137	0.0100251	0.0059	0.9343
24	0.2560886	0.0125550	0.0057	0.9400
25	0.2435336	0.0093564	0.0054	0.9454
26	0.2341772	0.0274063	0.0052	0.9506
27	0.2067709	0.0084111	0.0046	0.9552
28	0.1983598	0.0095442	0.0044	0.9596
29	0.1888156	0.0150164	0.0042	0.9638

30	0.1737992	0.0112208	0.0039	0.9677
31	0.1625784	0.0039460	0.0036	0.9713
32	0.1586323	0.0128571	0.0035	0.9748
33	0.1457752	0.0225471	0.0032	0.9781
34	0.1232281	0.0067043	0.0027	0.9808
35	0.1165238	0.0131062	0.0026	0.9834
36	0.1034176	0.0046151	0.0023	0.9857
37	0.0988025	0.0016217	0.0022	0.9879
38	0.0971808	0.0094509	0.0022	0.9901
39	0.0877299	0.0070055	0.0019	0.9920
40	0.0807244	0.0088643	0.0018	0.9938

The FACTOR Procedure

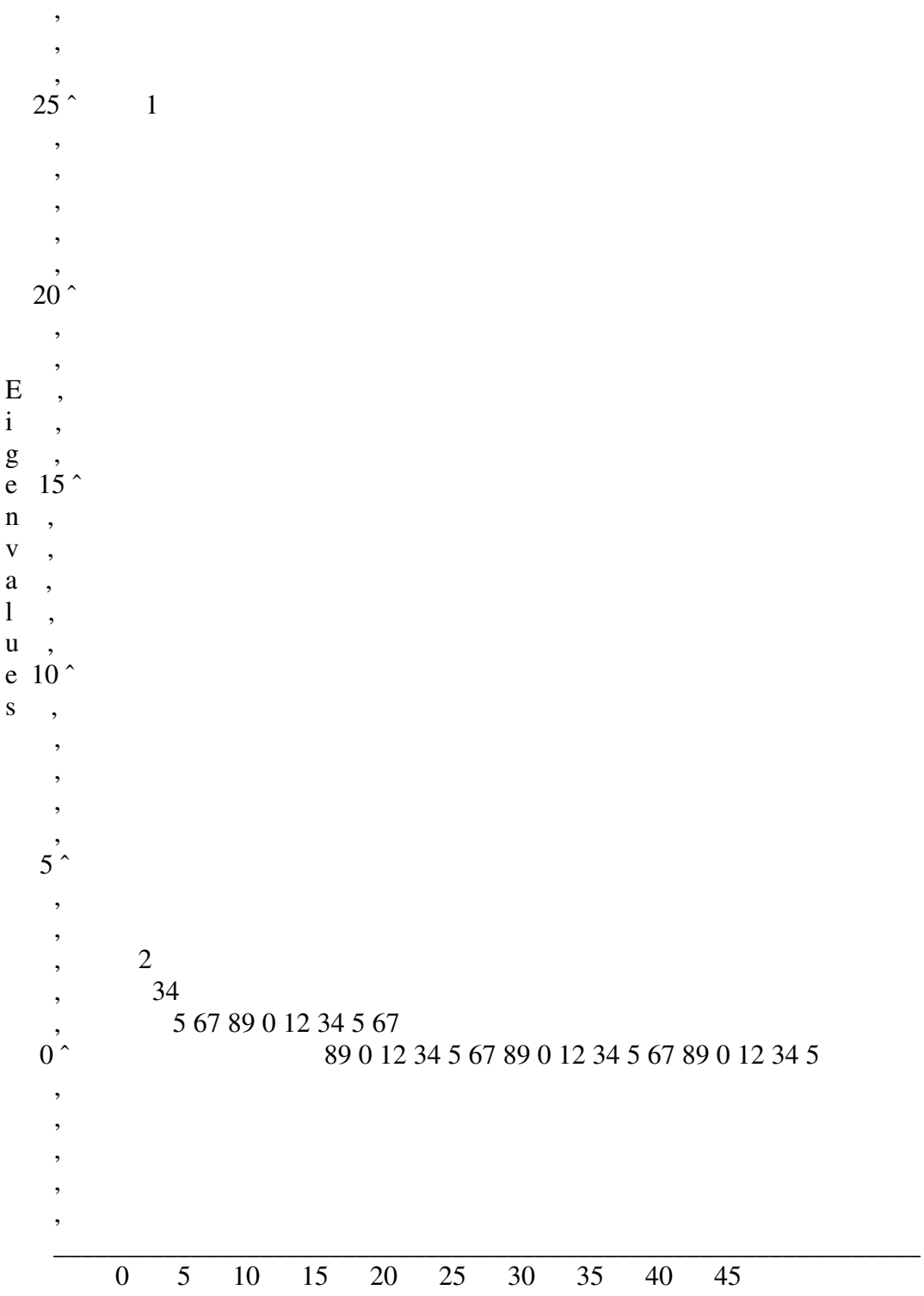
Initial Factor Method: Principal Components

Eigenvalues of the Correlation Matrix: Total = 45 Average = 1

	Eigenvalue	Difference	Proportion	Cumulative
41	0.0718601	0.0096317	0.0016	0.9954
42	0.0622284	0.0031224	0.0014	0.9968
43	0.0591059	0.0127954	0.0013	0.9981
44	0.0463105	0.0072570	0.0010	0.9991
45	0.0390535		0.0009	1.0000

3 factors will be retained by the NFACTOR criterion.

Scree Plot of Eigenvalues – USER SATISFACTION



The FACTOR Procedure
Initial Factor Method: Principal Components

Factor Pattern

	Factor1	Factor2	Factor3
ques41	0.87715	-0.12195	0.06080
ques33	0.87060	-0.14341	-0.13935
ques34	0.86077	-0.12004	-0.00183
ques23	0.85237	0.19983	0.06557
ques26	0.84463	0.17471	-0.03213
ques25	0.83703	0.17248	-0.01767
ques22	0.83654	0.15119	0.01008
ques31	0.83129	-0.15528	-0.16862
ques43	0.82818	-0.17855	0.00222
ques29	0.82770	-0.04275	0.02698
ques32	0.82513	-0.22090	-0.19941
ques44	0.81814	-0.16267	0.02250
ques42	0.81644	-0.21231	0.09066
ques17	0.81104	0.16307	-0.07948
ques27	0.80898	0.13190	-0.05599
ques16	0.80440	0.18642	-0.01857
ques10	0.79833	-0.10533	-0.19185
ques9	0.79551	-0.10514	-0.25876
ques8	0.78530	0.04975	-0.10691
ques11	0.78130	-0.18414	-0.24894
ques38	0.77955	-0.13718	0.42071
ques3	0.77174	0.02095	-0.17653
ques37	0.77127	-0.18925	0.44578
ques28	0.76855	0.18585	0.14255
ques20	0.76834	-0.25869	-0.14412
ques39	0.76382	-0.16948	0.41538
ques30	0.76002	0.10022	-0.14385
ques19	0.75625	-0.18935	-0.25992
ques24	0.75120	0.10796	0.07333
ques36	0.74717	-0.15054	0.47173
ques4	0.74519	-0.13380	-0.22127
ques21	0.74103	-0.20736	-0.15609
ques6	0.73666	0.23407	-0.06192

ques1	0.73345	0.10338	-0.13572
ques15	0.66093	0.36546	-0.01130
ques12	0.64466	0.50023	0.02139
ques2	0.64351	0.02385	-0.12730
ques7	0.61863	-0.11797	0.30584
ques5	0.61415	-0.12981	-0.03740
ques13	0.61299	0.59885	0.09405
ques45	0.56965	-0.04567	0.24879
ques18	0.36596	-0.14427	-0.09955
ques35	0.23344	-0.16284	-0.13220
ques14	0.56217	0.60764	0.09746
ques40	0.35613	-0.17365	0.54016

Variance Explained by Each Factor

Factor1	Factor2	Factor3
25.021720	2.102734	1.836862

Final Communality Estimates: Total = 28.961317

ques1	ques2	ques3	ques4	ques5	ques6
0.56705563	0.43088170	0.62717883	0.62217880	0.39543320	0.60128691
ques7	ques8	ques9	ques10	ques11	ques12
0.49015818	0.63060380	0.71084694	0.68522657	0.70631329	0.66628224
ques13	ques14	ques15	ques16	ques17	ques18
0.74321571	0.69475686	0.57052279	0.68215956	0.69069252	0.16465635
ques19	ques20	ques21	ques22	ques23	ques24
0.67532738	0.67804161	0.61649210	0.72275980	0.77076960	0.58133684
ques25	ques26	ques27	ques28	ques29	ques30
0.73067861	0.74496151	0.67498752	0.64552855	0.68764773	0.60837416

ques31	ques32	ques33	ques34	ques35	ques36
0.74359544	0.76940459	0.79793322	0.75534415	0.09848569	0.80345217
ques37	ques38	ques39	ques40	ques41	ques42
0.82940034	0.80351670	0.78467981	0.44875237	0.78796654	0.71986496
ques43	ques44	ques45			
0.71775913	0.69632330	0.38848286			

Rotation Method: Varimax
Orthogonal Transformation Matrix

	1	2	3
1	0.68970	0.55458	0.46558
2	-0.46150	0.83213	-0.30754
3	-0.55798	-0.00275	0.82985

Rotated Factor Pattern

	Factor1	Factor2	Factor3
ques32	0.78230	0.27433	0.28662
ques11	0.76275	0.28075	0.21380
ques19	0.75400	0.26255	0.19463
ques33	0.74439	0.36387	0.33380
ques9	0.74156	0.35440	0.18797
ques31	0.73909	0.33227	0.29485
ques20	0.72972	0.21123	0.31768
ques10	0.70626	0.35561	0.24487
ques4	0.69917	0.30253	0.20448
ques21	0.69388	0.23884	0.27925
ques43	0.65235	0.31070	0.44233
ques34	0.65009	0.37748	0.43616
ques41	0.62733	0.38480	0.49634
ques44	0.62679	0.31829	0.44961
ques3	0.62109	0.44591	0.20637
ques42	0.61049	0.27586	0.52065
ques8	0.57832	0.47720	0.26160
ques29	0.57554	0.42337	0.42090

ques30	0.55820	0.50528	0.20365
ques1	0.53388	0.49315	0.19706
ques5	0.50436	0.23268	0.29482
ques2	0.50385	0.37707	0.18663
ques18	0.37454	0.08317	0.13214
ques35	0.30991	-0.00568	0.04905
ques13	0.09393	0.83801	0.17927
ques14	0.05292	0.81713	0.15574
ques12	0.20183	0.77371	0.16405
ques15	0.29349	0.67068	0.18595
ques23	0.45907	0.63881	0.38981
ques26	0.51984	0.61388	0.31285
ques25	0.50755	0.60777	0.32199
ques6	0.43460	0.60348	0.21960
ques16	0.47912	0.60128	0.30177
ques22	0.50156	0.58971	0.35134
ques17	0.52846	0.58570	0.26149
ques28	0.36476	0.58048	0.41896
ques27	0.52833	0.55855	0.28962
ques24	0.42736	0.50624	0.37739
ques37	0.37055	0.26902	0.78722
ques36	0.32158	0.28779	0.78563
ques38	0.36622	0.31701	0.75426
ques39	0.37325	0.28142	0.75244
ques40	0.02436	0.05151	0.66746
ques7	0.31046	0.24407	0.57810
ques45	0.27515	0.27723	0.48572

Variance Explained by Each Factor

Factor1	Factor2	Factor3
12.922112	9.151552	6.887653

Final Communality Estimates: Total = 28.961317

ques1	ques2	ques3	ques4	ques5	ques6
0.56705563	0.43088170	0.62717883	0.62217880	0.39543320	0.60128691
ques7	ques8	ques9	ques10	ques11	ques12
0.49015818	0.63060380	0.71084694	0.68522657	0.70631329	0.66628224
ques13	ques14	ques15	ques16	ques17	ques18
0.74321571	0.69475686	0.57052279	0.68215956	0.69069252	0.16465635
ques19	ques20	ques21	ques22	ques23	ques24
0.67532738	0.67804161	0.61649210	0.72275980	0.77076960	0.58133684
ques25	ques26	ques27	ques28	ques29	ques30
0.73067861	0.74496151	0.67498752	0.64552855	0.68764773	0.60837416
ques31	ques32	ques33	ques34	ques35	ques36
0.74359544	0.76940459	0.79793322	0.75534415	0.09848569	0.80345217
ques37	ques38	ques39	ques40	ques41	ques42
0.82940034	0.80351670	0.78467981	0.44875237	0.78796654	0.71986496
ques43	ques44	ques45			
0.71775913	0.69632330	0.38848286			

Cronbach Coefficient Alpha

Variables	Alpha
Raw	0.972827
Standardized	0.973700

The CORR Procedure

Cronbach Coefficient Alpha with Deleted Variable

	Raw Variables		Standardized Variables	
Deleted Variable	Correlation with Total	Alpha	Correlation with Total	Alpha
ques1	0.701975	0.972201	0.701231	0.973180
ques2	0.621812	0.972964	0.620920	0.973877
ques3	0.760974	0.971701	0.761323	0.972655
ques4	0.766412	0.971660	0.764573	0.972627
ques5	0.606646	0.973418	0.606715	0.973999
ques8	0.752714	0.971778	0.753797	0.972721
ques9	0.819231	0.971219	0.819152	0.972147
ques10	0.816700	0.971197	0.815359	0.972180
ques11	0.817211	0.971251	0.816919	0.972167
ques19	0.779777	0.971543	0.780635	0.972486
ques20	0.782142	0.971533	0.782467	0.972470
ques21	0.742004	0.971865	0.742799	0.972818
ques29	0.785191	0.971486	0.786097	0.972438
ques30	0.723633	0.972199	0.725914	0.972965
ques31	0.839501	0.971004	0.840181	0.971961
ques32	0.852681	0.970857	0.852666	0.971851
ques33	0.874014	0.970771	0.874290	0.971659
ques34	0.847494	0.971132	0.847933	0.971892
ques41	0.857685	0.970881	0.858202	0.971802
ques42	0.795665	0.971391	0.797584	0.972337
ques43	0.822769	0.971179	0.824100	0.972103
ques44	0.814958	0.971243	0.815763	0.972177

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